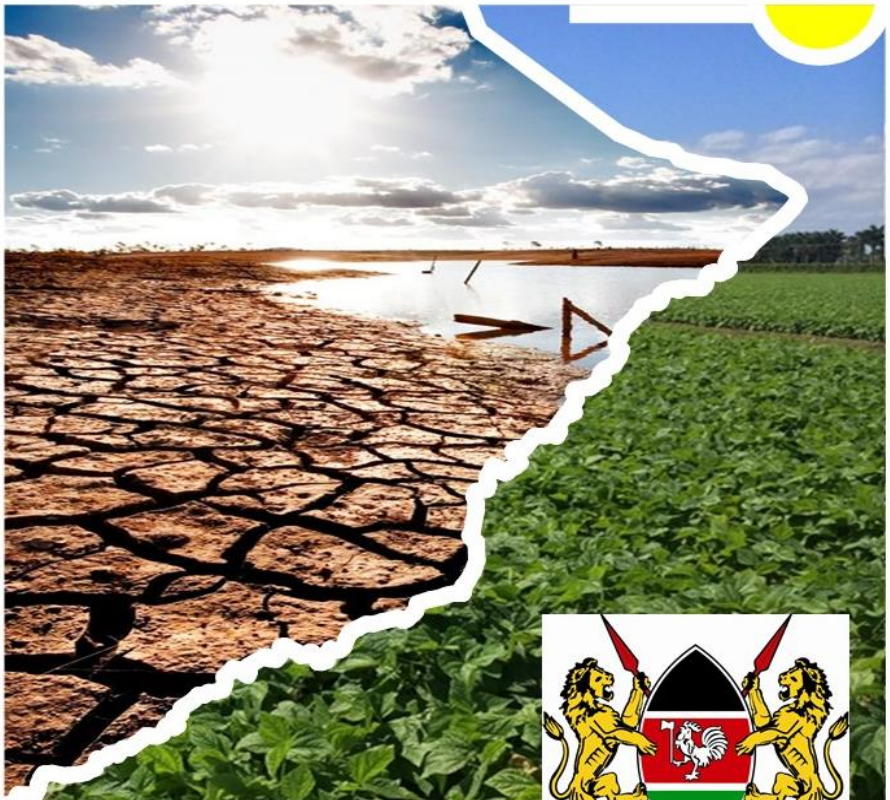
COUNTY GOVERNMENT OF BOMET

Participatory Climate Risk Assessment (PCRA)



MAY 2023

Foreword

Bomet's economy is highly dependent on the natural resource base, and thus is highly vulnerable to climate variability and change. Rising temperatures and changing rainfall patterns increase the frequency and intensity of extreme weather events such as droughts and flooding that pose a threat to the sustainability of our development. In this regard therefore, we have consulted with various stakeholders to put in place several mitigation and adaptive mechanisms to curb further effects of climate change on our ecosystem.

In order to safeguard sustainable development, Bomet has demonstrated its commitment to climate action. First off, we conducted countywide Participatory Climate Risk Assessment (PCRA) whose recommendations informed the development of a strategic five-year County Climate Change Action Plan (CCCAP) aimed at providing clear and concise response priorities to climate variability and change.

The Bomet County Climate Change Act, 2021 has been enacted through the County Assembly's support. The legislation seeks to protect the climate system for the benefit of the current and future generations by supporting the National legislations and policies and the United Nations Framework Convention on Climate Change (UNFCCC) process, ratifying the Kyoto Protocol in 2005, and contributing to continental and regional climate change initiatives. With the Action Plan in place, my government is focused on implementing key interventions that can help to achieve the goal of low carbon climate resilient development. These efforts will go a long way in addressing the adverse effects of climate change cutting across key sectors that are important to the economy and society: Environment, Water and Forestry; Agriculture, Livestock and Fisheries; Trade; Extractive industries; Energy; Physical Infrastructure; Tourism; and Health.

Bomet County has also established Climate Change Resilience Investment (CCRI) Funds to ensure that the county's systems of governance, ecosystems and society have the capability to maintain competent function in the face of climate change. This will assist in a return to some normal range of function even when faced with adverse impacts of climate change. Adaptive capacity is key to improving the socio-economic characteristics of communities, households and industry as it includes adjustments in behaviour, resources and technologies, and is a necessary condition for design and implementation of effective adaptation strategies. There is mutual reliance in that the national adaptive capacity depends on the resilience of its systems.

I urge all the stakeholders to join hands with us in protecting our natural resources for posterity and future generations. To achieve the desired climate action, we must all work together. I also appeal to every citizen, agencies and local communities take up the challenge and save our ecosystems by adhering to appropriate adaptive and mitigation capacities for socio-economic development of our society.

H.E PROF HILLARY BARCHOK, EGH
GOVERNOR, BOMET COUNTY

Acknowledgement

The Department of Water, Sanitation, Environment, Natural Resources and Climate Change has made major strides geared towards sustainable development. As a Department we are continuously partnering with stakeholders to ensure that we achieve sustainable development through the implementation of an integrated climate change development plan. As such, we have realized the development of the Bomet County Climate Change Action Plan (BCCCAP) with a key focus to facilitate a coordinated, coherent and effective response to climate change's local, County, national and global challenges and opportunities.

As a Department, we have adopted an overarching mainstreaming approach to ensure the integration of climate change considerations into development planning, budgeting and implementation. In response to climate change in Bomet County, the Action Plan is poised to adhere to the constitutional governance framework and commitment to sustainable development as per the Bomet County Climate Change Act, 2021.

We have also made efforts to realize the establishment of Climate Change Resilience Investment (CCRI) Funds that seek to look into the county's systems of governance, ecosystems and society have capability to maintain competent function in the face of climate change.

Adaptive capacity is key to improving socio-economic characteristics of communities, households and industry as it includes adjustments in behavior, resources and technologies, and is a necessary condition for design and implementation of effective adaptation strategies. There is mutual reliance in that the national adaptive capacity depends on the resilience of its systems. Thus, we are compelled to enhance our adaptive capacities and build resilience to climate variability and change.

I wish to laud the Director of Climate Change for coordinating the entire process of developing the strategic *BCCCAP 2022-2026* and managing contributions from the experts whose expertise and professionalism have been instrumental throughout the entire process of developing the Plan.

Lastly, I acknowledge and appreciate the support from Financing Locally-Led Climate Action (FLLoCA) program under National Treasury and National Treasury Project Implementation Unit (NTPIU) for financing the *BCCCAP 2022-2026* and guiding us throughout the process.

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Acronyms

ADP	Annual Development Plan
BCCCAP	Bomet County Climate Change Action Plan
CBO	Community Based Organization
CCCF	County Climate Change Fund
CCU	Climate Change Unit
CECM	County Executive Committee Member
CFA	Community Forest Association
CGB	County Government of Bomet
CIDP	County Integrated Development Plan
DP	Development Partners
FLoCCA	Financing Locally-Led Climate Action
GIS	Geographic Information Systems
GoK	Government of Kenya
ICT	Information Communication Technology
KENHA	Kenya National Highways Authority
KeRRA	Kenya Rural Roads Authority
KFS	Kenya Forest Service
KMD	Kenya Meteorological Department
KURA	Kenya Urban Roads Authority
KWS	Kenya Wildlife Service
M&E	Monitoring and Evaluation
MoECC&F	Ministry of Environment Climate Change and Forestry
NCCAP	National Climate Change Action Plan
NCCC	National Climate Change Council
NDMA	National Drought Management Authority
NEMA	National Environment Management Authority
NGO	Non-Governmental Organization
NTPIU	National Treasury Project Implementation Unit
PWD	People Living with Disabilities
TOR	Terms of Reference
TWG	Technical working Group
WRA	Water Resource Authority
WRUA	Water Resource Users Association
WSE&CC	Water, Sanitation, Environment and Climate Change

Definition of Terms

Adaptation means adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities.

Adaptive capacity refers to the ability of systems, institutions, humans, and other organisms to adjust to potential damage, take advantage of opportunities, or respond to consequences.

Carbon credit or offset is a financial unit of measurement that represents the removal of one tonne of carbon dioxide equivalent from the atmosphere. Carbon credits are generated by projects that deliver measurable reductions in greenhouse gas emissions.

Carbon market is a market created from the trading of units of greenhouse gas emissions.

Climate change refers to a change in the climate system that is caused by significant changes in the concentration of greenhouse gases due to human activities, and which is in addition to the natural climate change that has been observed during a considerable period.

Global warming refers to the observed or projected gradual increase in global surface temperature. It is one of the consequences of climate change.

Greenhouse gases (GHGs) are gases that absorb and emit radiant energy within the thermal infrared range. The main GHGs measured in a GHG inventory are, carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), perfluorocarbons (PFCs), hydrofluorocarbons (HFCs), sulphur hexafluoride (SF) and nitrogen trifluoride (NF).

Mitigation refers to human interventions to prevent or slow down atmospheric GHG concentrations by limiting current or future emissions, and/or enhancing potential sinks for greenhouse gases.

Resilience refers to the capacity of social, economic and environmental systems to cope with a hazardous event, trend, or disturbance. It is manifested through responding or reorganizing in ways that assert the essential function, identity, and structure of the system, while also maintaining the capacity for adaptation, learning and transformation.

Vulnerability refers to the propensity or predisposition to be adversely affected. It encompasses a variety of concepts and elements, including sensitivity or susceptibility to harm, and lack of capacity to cope and adapt.

Executive summary

Bomet's economy is highly dependent on the Natural Resource Base, and thus is highly vulnerable to climate variability and change(s). Rising temperatures and changing rainfall patterns, resulting in increased frequency and intensity of extreme weather events such as prolonged dry spell and inland flooding, threaten the sustainability of the county's development. In order to safeguard sustainable development, the County has developed the Climate Change Policy to provide a clear and concise articulation of overall response priorities to climate variability and change. To operationalize the policy, the county has developed this Climate Risk and vulnerability Assessment Report that profiles vulnerability of the county in terms of climate change.

Participatory climate change approach involved engaging local communities, stakeholders, and decision-makers in the process of understanding and addressing the impacts of climate change. These approaches recognize the importance of local knowledge and expertise in developing effective climate change responses, and aim to empower communities to take action on climate change. Bomet county government formed Ward Climate Change Planning Committee (WCCPC) and trained them in 2022. These committees were drawn from the community level through a rigorous process where the community members elected themselves. The criteria used during the composition of these committees factored in the gender, youth, and people living with disabilities. These are the groups who were involved during PCRA process. WCCPC was established under sect 22 of Bomet County Climate Change Act 2021.

The overall objective of the Assessment is to map out vulnerability of the county to climate change and develop adaptive strategies towards adaptation and resilience. The project has two expected high-level outcomes: To provide a detailed Bomet County Climate Change vulnerability report of high medium and low risk areas; Develop proposed intervention measures to combat climate change.

The most common climatic hazards in Bomet county were identified by the communities and community groups. The potential risks from these hazards were also identified. The common hazards include the prolonged dry spell, pest and diseases, frost and hailstones, soil erosion and strong winds. The table below summarizes the differentiated Climate exposure and Vulnerability of key groups.

Key group	Impacts
Women	• Due to prolonged dry spell, women travel long distances to fetch water • Long-time taken to fetch water for household has an impact on their other economic activities. • Cases of gender-based violence are reported because the women shoulder stress from men due to decline in income. • Due to decline in food and nutrition during prolonged dry spell, women are most affected especially during menstrual cycles.
People Living with Disabilities (PWD)	• When there are floods, mobility of the PWDs are affected especially in areas like Chepalungu sub county. • Extreme temperatures affect people who have albinism. • The impacts of the prolonged dry spell e.g. lack of water, decrease in income, lack of pasture etc. affects the PWDs greatly because they lack flexibility to diversify and cope with the change.
Elderly	• The elderly are affected by the lack of food caused prolonged dry spell affecting their well-being due to lack of nutrition.

Key group	Impacts
	• The floods and other climate change related disasters affected the mobility of the elderly as well as ability to adapt to the changes.
Children	• infrastructure damage e.g. schools by strong winds reported in some parts of Bomet county affects the school going children. • Declines in school attendance, and rising dropout rates especially during disaster like floods. • Impacts of prolonged dry spell affects the children especially those fetches water for the family since a lot of time is spent walking long distances. • It has been proved that, due to diminished income during prolonged dry spell, there are high cases of domestic violence hence, children are the victims. • Children mostly assist during livestock keeping, when the pastures decline, these children are forced to spent more hours looking for pasture.

Vulnerability assessment matrix

As shown in the table below, agriculture is the most vulnerable sector to climate change in Bomet County with crop farming highly affected than livestock farming. Climate change has a medium impact on water, health, infrastructure and forestry in the county.

Sector	Prolonged Dry Spell	Floods	Pest and Diseases	Soil Erosion	Landslide	Strong Winds	Hailstones and Frost	Total	Overal Vulnerability
Crop farming	3	2	3	2	1	2	2	15	
Livestock farming	3	1	2	1	1	1	1	10	
Water	3	1	0	2	1	1	0	8	
Health	1	2	1	1	1	1	1	8	
Infrastructure	0	2	0	1	2	2	0	7	
Forestry	2	1	1	1	1	1	1	8	
Total	12	9	7	8	7	8	5	56	

As indicated in the table below, Bomet county has been affected by climate change with Chepalungu subcounty being more vulnerable than the other Sub-Counties. The participants indicated that pest and diseases was the hazard contributing to high vulnerability in the sub-county. The source of livelihoods in this sub county is majorly livestock keeping and crop farming. Also, prolonged dry spell and Floods are among the hazards which increased vulnerability in the sub-county. It is worth to note that, the exposure and severity of the hazards that guided the rating by the community. Others sub counties had similar vulnerability rating, with prolonged dry spell, floods, pest and diseases as hazards which had contributed to vulnerability. Moreover, hailstones and frost, have low effects on all the sub-Counties except Konoin and Bomet central. This can be attributed to tea plantation being is a source of livelihood in these areas.

Sub-County	Prolonged Dry Spell	Floods	Pest and Diseases	Soil Erosion	Landslide	Strong Winds	Hailstones and Frost	Total	Overal Vulnerability
Bomet East	3	1	2	2	1	1	1	11	
Bomet Central	2	2	2	1	1	1	2	11	
Konoin	2	2	2	1	1	1	2	11	
Chepalungu	2	2	3	2	1	1	1	12	
Sotik	2	1	2	2	1	2	1	11	
Total	11	8	11	8	5	6	7	56	

Key

>10		High
5 to 9		Medium
<5		Low

1 : Context of the Participatory Climate Risk Assessment (PCRA)

1.1 Background

Bomet economy is highly dependent on the Natural Resource Base, and thus is highly vulnerable to climate variability and change(s). Rising temperatures and changing rainfall patterns, resulting in increased frequency and intensity of extreme weather events such as prolonged dry spell and inland flooding, threaten the sustainability of the county's development. In order to safeguard sustainable development, the County has developed the Climate Change Policy to provide a clear and concise articulation of overall response priorities to climate variability and change. To operationalize the policy, the county has developed this Climate Risk and vulnerability Assessment Report that profiles vulnerability of the county in terms of climate change.

The County has shown commitment to protect the climate system for the benefit of the present and future generations by supporting the United Nations Framework Convention on Climate Change (UNFCCC) process, and contributing to regional and National climate change initiatives.

Climate change adversely impacts key sectors that are important to the economy and society of Bomet county and the community: Environment, Water, Agriculture, Livestock; Trade; Physical Infrastructure; Tourism; and Health. The Assessment, therefore elaborates high, medium and low risk areas. The report also proposes interventions and measures that can help to achieve the goal of low carbon climate resilient development. This will leverage mobilization of resources from partners, donors and national governments towards efforts to combat climate change. In addition, the report will enhance adaptive capacity and build resilience to climate variability and change, while promoting a low carbon development pathway. Adaptive capacity is therefore key to improving socio-economic characteristics of communities, households and industry as it includes adjustments in behavior, resources and technologies, and is a necessary condition for design and implementation of effective adaptation strategies. There is mutual reliance in that the national adaptive capacity depends on the resilience of its systems.

1.2 Policy context

1.2.1 The National (Kenya) Climate Change Policy and Legal Framework

At the national level, the climate change policy and legal framework consists of policies, laws, strategies and plans as discussed in the following sections.

1.2.1.1 The National Climate Change Response Strategy (NCCRS), 2010

The NCCRS was the first national document on climate change formulated in 2010. The strategy focuses on ensuring that adaptation and mitigation measures are integrated in all government planning and development objectives. The objective of the strategy is to respond to climate change by: Enhancing the understanding of the global climate change negotiations process, international agreements, policies and processes and most importantly, the positions Kenya needs to take in order to maximise beneficial effects; assessing the evidence and impacts of climate change in Kenya; recommending robust adaptation and mitigation measures needed to minimise risks associated with climate change while maximising opportunities; enhancing understanding of climate change and its impacts nationally and in local regions; recommending vulnerability assessment, impacts monitoring and capacity building framework needs;

recommending research and technological needs and avenues for transferring existing technologies; providing a conducive and enabling policy, legal and institutional framework to combat climate change; and, providing concerted action plan, resource mobilisation plan and robust monitoring and evaluation plan.

The NCCRS laid the foundation for the establishment of the current climate change response policy and legislative framework in Kenya. The policies, plans and legislations emanating from the implementation of the strategy include: The National Climate Change Action Plans; the National Adaptation Plan; the National Climate Change Framework Policy of 2016; and the National Climate Change Act.

1.2.1.2 The National Climate Change Framework Policy-2016

The National Climate Change Framework Policy was ratified by the National Assembly in 2016. The main objective of the policy is to enable a coordinated, coherent and effective response to the local, national and global challenges and opportunities presented by climate change. The policy aims to enhance adaptive capacity and build resilience to climate variability and change, while promoting a low carbon development pathway. The policy identifies the adaptive capacity of individuals and communities as being key to improving their socio-economic situations. Thus, to effectively establish the adaptive capacities of individuals and communities, the policy recognises the need for vulnerability assessment. As a policy statement on enhancing climate resilience and adaptive capacity, the Government commits to ensure integration of climate change risk and vulnerability assessment in environmental impact assessments and strategic environmental assessments. The policy further compels the Government to promote public and stakeholder consultation and participation, including with vulnerable groups, to enhance adaptive capacity and climate resilience.

1.2.1.3 The National Climate Change Action Plan (NCCAP)

The first NCCAP in Kenya was developed in 2012 to cover the five-year period between 2013-2017. The NCCAP 2013-2017 aimed to enhance the implementation of the NCCRS and to contribute to the achievement of t Vision 2030. The NCCAP 2013-2017 had eight indicators namely: long term national low carbon climate resilient development pathway; enabling policy and regulatory framework; adaptation analysis and prioritisation; mitigation actions; technology; national performance and benefit measurement; knowledge management and capacity development; and finance. The plan specified priority actions for the realization of each of the eight indicators. The NCCAP 2013-2017 contributed to the improvement in Kenya's climate change policy and legal framework and to the establishment of climate change funds in five counties13. It also informed the development of the National Adaptation Plan (NAP).

The National Climate Change Action Plan (NCCAP) 2018-2022 was developed pursuant to the provisions of the Climate Change Act, 2016. The NCCAP 2018-2022 builds on the NCCAP 2013-2017. It contains detailed actions that the country intended to take to tackle climate change from 2018 to 2023. The plan set out to support Kenya's development goals by providing mechanisms and measures to achieve low carbon climate resilient development in a manner that prioritizes adaptation and recognises the essence of enhancing the climate resilience of vulnerable groups including children, women, youth, persons with disabilities, the elderly and marginalized and minority communities. The plan specifically seeks to: Align climate change actions in the country with the Government's development agenda, including the Big Four Agenda; encourage participation of the private sector, civil society and vulnerable groups within society, including children, women, older members of society, persons with disabilities, youth and members of minority or marginalized communities; provide the framework to deliver

Kenya's NDC for the 2018-2022 period; and, provide a framework for mainstreaming climate change into sector functions at the National and County levels.

1.2.1.4 The Climate Change Act No. 11 of 2016

The Climate Change Act came into force in 2016. The main objective of the Act is to govern the development, management, implementation and regulation of mechanisms to enhance climate change resilience and low carbon development for the sustainable development of Kenya. The Act is to be applied to all sectors of the economy by both the national and county governments. Specifically the Act is to be applied to ensure among other objectives: Mainstreaming of climate change responses into development planning, decision making and implementation; building resilience and enhancing adaptive capacity to the impacts of climate change; formulation of programmes and plans to enhance the resilience and adaptive capacity of human and ecological systems to the impacts of climate change; and, mainstreaming and reinforcing climate change disaster risk reduction into strategies and actions of public and private entities.

1.2.2 Bomet County Climate Change Policy and Legal Framework

The county framework here refers to the climate change policy and legal framework in Bomet County. This framework included the Bomet County Integrated Development Plan (CIDP) 2018-2022 and the Bomet County Climate Change Act, 2021.

1.2.2.1 The Bomet Climate Change Act, 2021

The County Government of Bomet has developed the Bomet Climate Change Act, 2021. The Bill provides a climate change governance and response framework in the County. It provides the framework and mechanisms for mobilization and facilitation of the county government, communities and others stakeholders to respond effectively to climate change through appropriate adaption and mitigation measures and actions.

It provides for: climate change coordination and oversight framework; planning and implementation framework; measures and actions for responding to climate change; and the duties relating to climate change in the County.

1.3 Purpose of the PCRA Report

The study aims to determine the nature and extent of the current and future climate change risks, by analyzing potential hazards and assessing the vulnerabilities that could pose potential threats or harm to Bomet County's population, property, livelihoods, and the environment on which they depend on.

The overall objective of the Assessment is to map out vulnerability of the county to climate change and develop adaptive strategies towards adaptation and resilience. The project has two expected high-level outcomes:

i. To provide a detailed Bomet County Climate Change vulnerability report of high medium and low risk areas.

ii. Develop proposed intervention measures to combat climate change.

1.4 Key steps in the county's PCRA process

Participatory climate change approach involved engaging local communities, stakeholders, and decision-makers in the process of understanding and addressing the impacts of climate change. These approaches recognize the importance of local knowledge and expertise in developing

effective climate change responses, and aim to empower communities to take action on climate change.

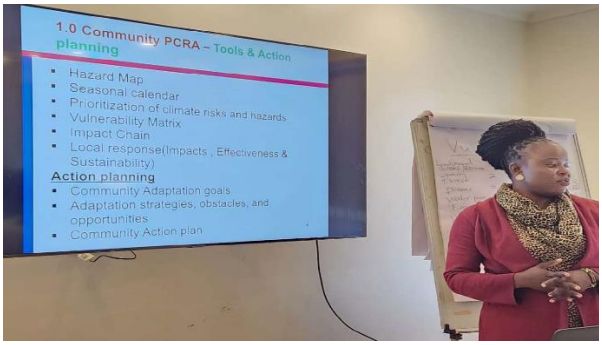
Bomet county government formed Ward Climate Change Planning Committee (WCCPC) and trained them in 2022. These committees were drawn from the community level through a rigorous process where the community members elected themselves. The criteria used during the composition of these committees factored in the gender, youth, and people living with disabilities. These are the groups who were involved during PCRA process. WCCPC was established under sect 22 of Bomet County Climate Change Act 2021.

1.4.1 Training of the Technical Working Group (TWG)

The process began by formation of the Technical Working group which was trained and engaged in the identification of stakeholders both at ward and County Level. The purpose of the training was to build the capacity of participants in conducting PCRA to enhance climate change adaptation and resilience building in Bomet County. The training was done from 20th to 24th March 2023 at Exotic Hotel-Kericho.

The technical working group (TWG) comprises of the directors drawn from all the county departments, NEMA, meteorological department, KFS, KWS among others. TWG was the lead team for Countywide vulnerability assessment and climate change action Plan and ultimately carry out stakeholders' analysis for the 25 Wards.

TWG Training session



Facilitator discussing PCRA tools

1.4.2 Hazard identification and Prioritization Matrix

The hazard Prioritization Matrix was used to stimulate the participatory information generation process and also to understand the community's perceptions of various types of hazards they encounter. The matrix provides the current perception of the community on the severity and the frequency of different disasters.

Participants were asked to list all the hazards experienced in their locality. A scale from 1 to 5 was used to mark the severity (S) and the frequency (F) of the different disasters, with 1 as the lowest score and 5 as the highest. Scores for each disaster type were obtained by multiplying the marks given for severity and frequency (F x S). These scores were then used to rank hazards, allowing priorities to be identified and giving focus to hazards and adaptive strategies.

On the other hand, the participants considered every hazard in turn and decide by consensus which is the most critical. If the participants did not decide easily between two particular hazards, the facilitator asked which most affects the poor and vulnerable members of the community. This enabled participants to agree more easily on a ranking. This tool worked well after the

impacts of the hazards had been thoroughly explored (e.g. through the sensitivity assessment tool).

The outcome of this exercise was later cross-checked by the consultant with available hazard data from governments or other institutions.

1.4.3 Hazard Mapping

Participatory Hazard Mapping is one of the most common tools used to map a specific area, identify general infrastructures, houses and livelihood assets and weigh their exposure to hazards that are changing or introduced with climate change. It was found that the participatory nature of the tool makes it an effective tool to tap climate risk information and identify potential risks across locations. The map depicts the type of hazard, its location, route/influence, its potential extent, and resources that are exposed to it (such as houses, springs, livestock, roads and bridges, schools, or market places). Hazards were marked using a cross or another well-known symbol. GIS based land information makes participatory or community-based hazard mapping more accurate and effective. The community was asked to draw the map of their ward and map all the community assets and hazards identified above. These maps were further processed using ArcGIS to produce more accurate georeferenced map. The figure below shows an example of a hazard map of the ward done by the community.

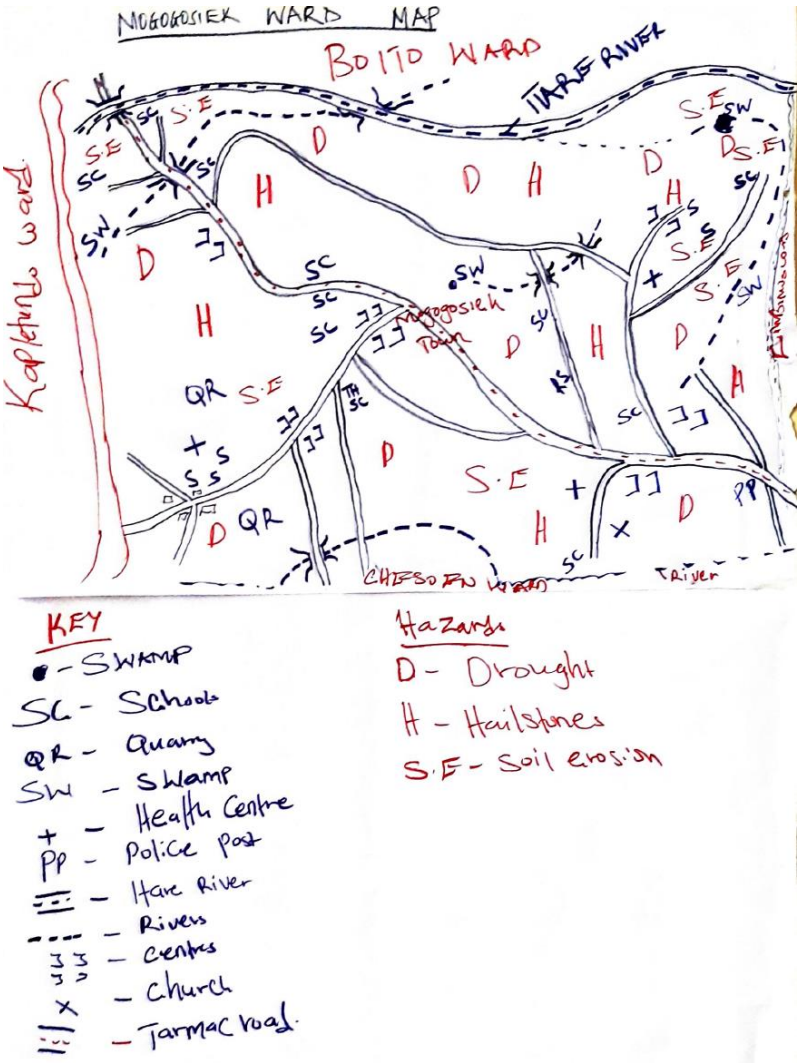


Figure 1-1: A sample of the Hazard map drawn by the community during data collection

1.4.4 Seasonal Calendar

The seasonal calendar can be used to identify timing, the period and stresses related to disasters over an annual cycle. This tool is able to capture information about seasonal weather changes and hazards, diseases, community events and other information relevant to livelihoods under each month of a year. Nature dependent livelihood activities rely on timely seasonal or weather changes; timing and amount of rains, dry spells and other environment dynamics. A discussion was done with the community related to observed seasonal changes in the environment and how the community has changed practices to adapt their livelihoods. The team leader of the group plotted the seasons on a flip chart as members contributed on how the seasons were compared between the past 20-30years and current state.

The number of variables or elements changed from ward to ward depending on community perceptions. The seasonal calendar provided information on change in the time of occurrence of the climate events. The assessment of character and magnitude of the variables is also equally important even if they occur during the usual seasons, such as the intensity and characteristics of rainfall or droughts, or the severity temperatures, for example. The figure below shows the sample of the seasonal calendar done by the community.

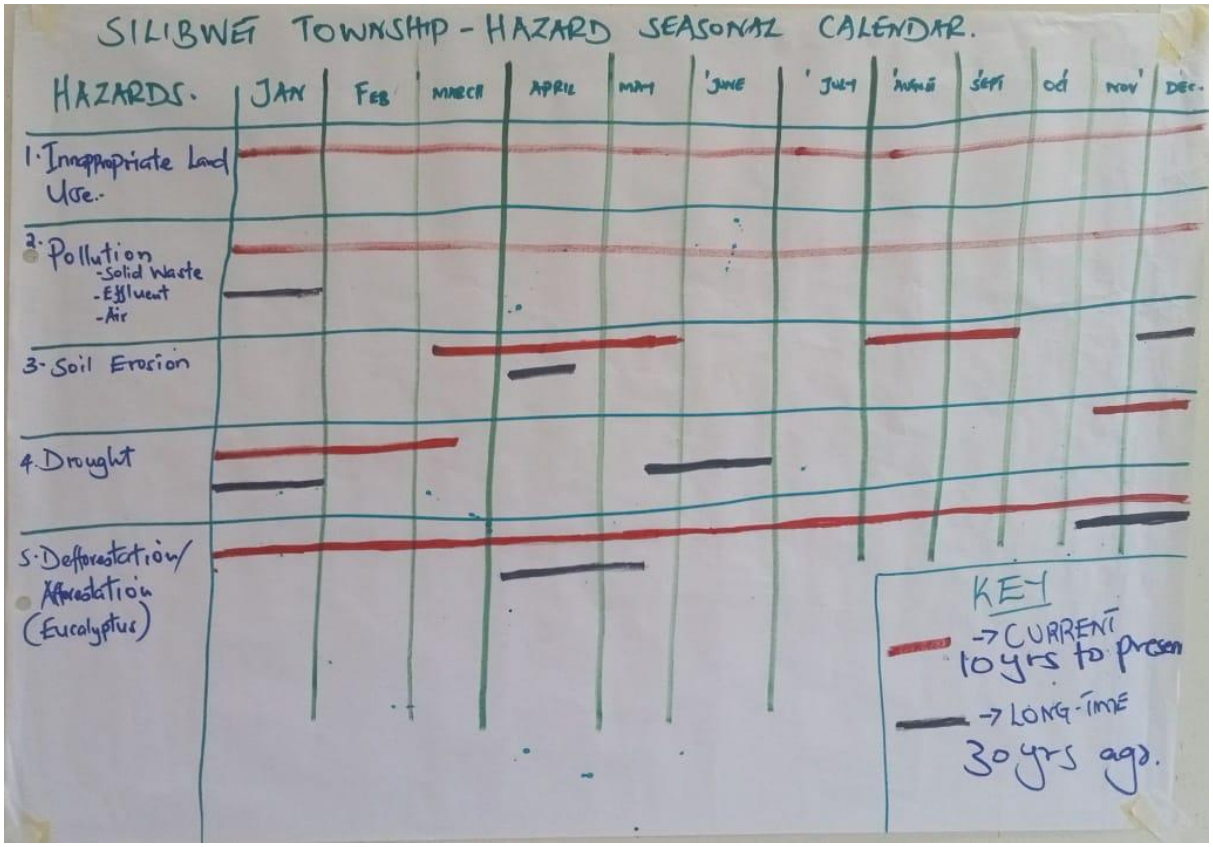


Figure 1-2. A sample of a Seasonal calendar for Silibwet township ward drawn by community

1.4.5 Vulnerability assessment

This tool was used to assess the effects of climate change and its impacts on different sectors. The sectors considered were agriculture and food security; forest and biodiversity; water and energy; settlement and infrastructure; and human health. Focus was given on getting the following information:

1. Which are the sectors most affected by climate change-induced hazards based on those listed?

2. In each event of hazard, what is the magnitude of the effects on the sectors?

3. Has damage increased, decreased or remained static over past decades?

Based on this information, the effects of climate change and its impacts were assessed for the identified sectors. Through observation and assessment, communities ranked the effects as low, medium and high.

1.4.6 PCRA Validation workshop

The county government organized for the validation workshop were multi stakeholders were invited to discuss and validate the report.

Figure 1-3: Multi stakeholders validation workshop held in famous gate hotel, Bomet town

2 Bomet County Climate Hazard Profile

2.1 County Overview

Bomet is a multi-ethnic county but predominantly occupied by the Kipsigis sub-tribe of the Kalenjin tribe with its headquarters located in Bomet town. The major economic activities in the county include: tea farming, dairy farming and beef farming. Bomet County lies between latitudes 0º 29' and 1º 03' south and between longitudes 35º 05' and 35º 35' east. It is bordered by four counties, namely: Kericho to the north, Nyamira to the west, Narok to the south and Nakuru to the north-east covering an area of 2,037.4 Km². The county is the source of major rivers such as Mara and Itare which flow into Lake Victoria.

2.2 Administrative and Political Units

Bomet County is divided into five (5) Sub-Counties (Constituencies), 25 wards, 66 locations, 177 sub-locations and 1,977 villages. The locations and sub-locations are administrative units of the national government. The Bomet County Government Coordination Act, 2014 established Sub-County, Ward, Community and Village administration. Bomet County has five parliamentary constituencies and 25 electoral wards.

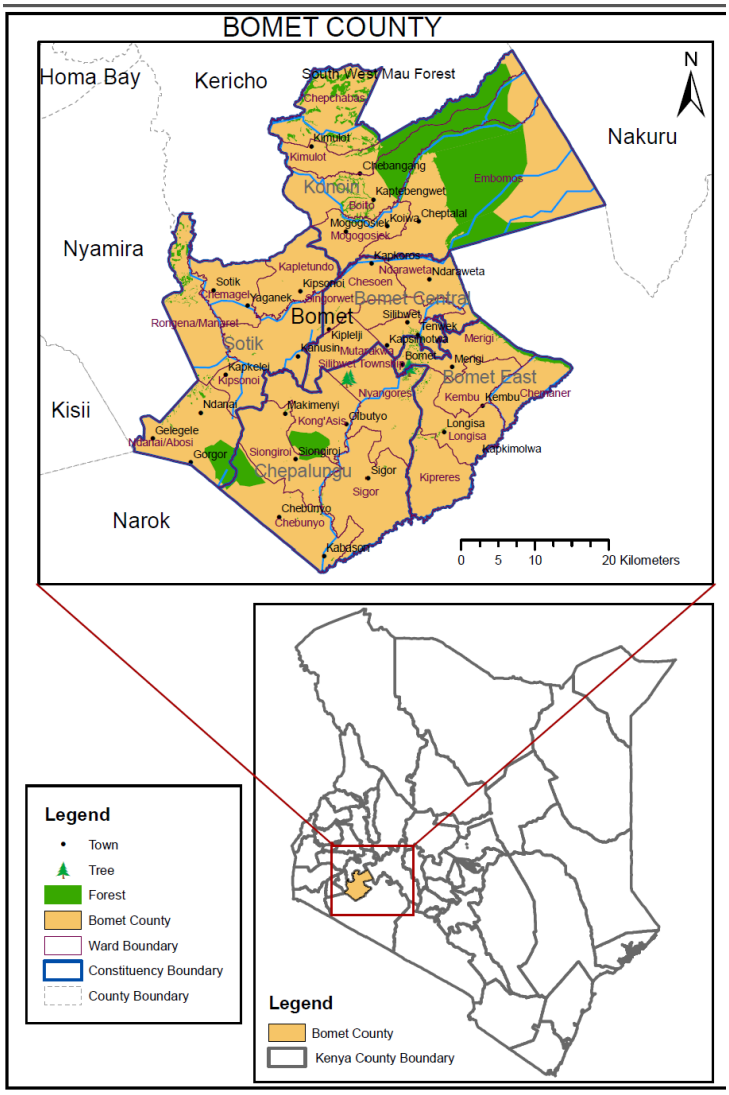


Figure 2-1*:* Map of Bomet county

2.3 Current and Historical Climate Hazards and Trends

2.3.1 Rainfall

Bomet County exhibits a tri-modal rainfall regime; March, April and May, MAM and called main rain season, June, July and August, JJA and October, November and December, OND and called short rain season. Rainfall in the county is further sub-divided into four climatic zones as shown in figure 2.2 below. The lower highland zone receives the highest annual rainfall of above 1400mm. The upper midland zone which lies west of the rift experiences uniform rainfall while in the upper midland zone on the southern part of the county, rainfall is low.

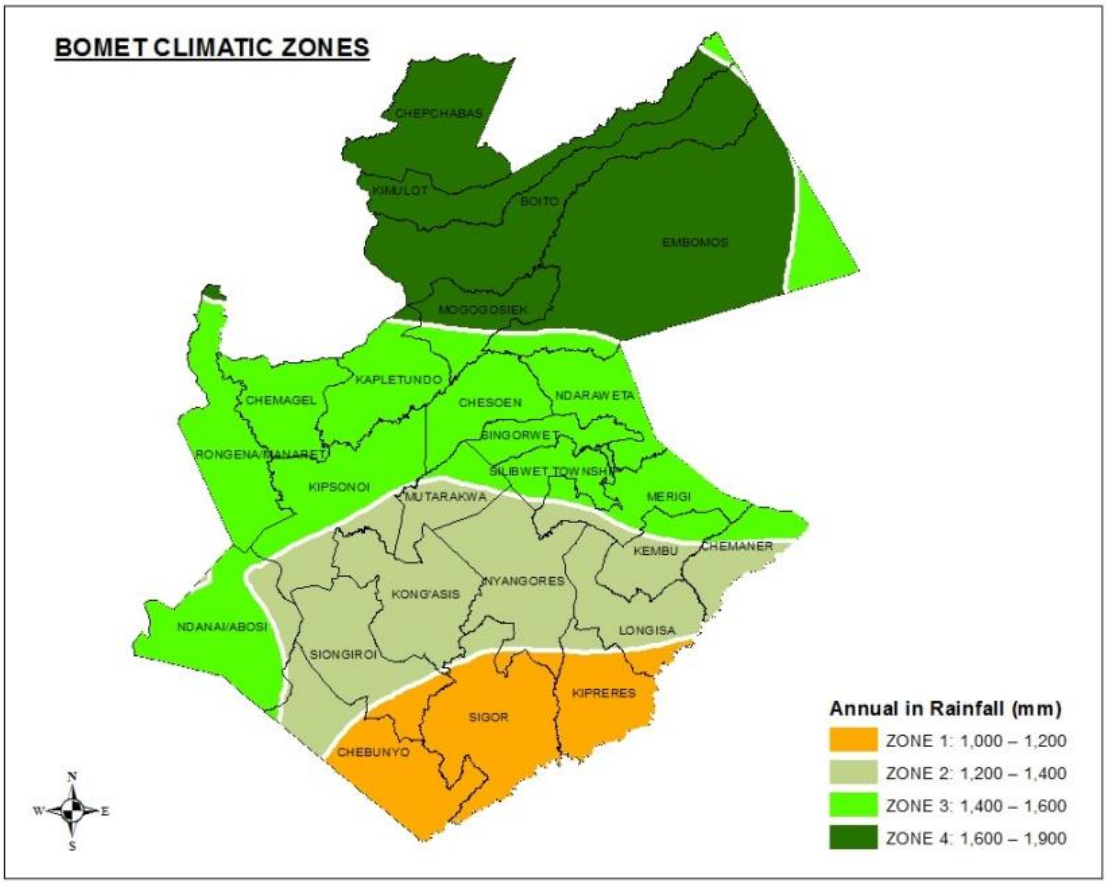


Figure 2-2*:* Bomet County annual rainfall climatic zones

Rainfall in the county is well distributed throughout the year except for the short dry season in January and February. Overall there is little or no break between short and long rains in the whole county. In the extreme south, rain starts in November and continues intermittently until June, when the dry season that lasts to November begins. In the extreme north, rains start towards the end of March and continue intermittently up to the end of December.

The abundant water sources and the even distribution of rain almost throughout the year explain why agriculture and livestock production are the main economic activities of the county. The upper midland zone in the southern part of the county is suitable for sunflower and maize production; livestock and sorghum activities are also practiced in this zone. Lower highland zone has a fairly good potential for pyrethrum if run-off loss of water and soil in the generally slopping areas is stopped by soil protection.

A total of four RCP scenarios (2005–2100), including RCP 2.6, RCP 4.5, RCP 6.0 and RCP 8.5, have been designed for the Coupled Inter-comparison Project No.5, CMIP5. Due to limited computational resources, RCP 4.5 and RCP 8.5 were selected for the Bomet PCRA. The central purpose of the selection was to evaluate the climate under a low-to-medium emission scenario (RCP 4.5) and a fossil fuel intensive emission scenario (RCP 8.5)

Figure 2.3 indicates the total annual rainfall under scenarios RCP4.5 and RCP8.5 by the years 2030 and 2050. Both scenarios project a percentage difference of between 0% and 20% of rainfall increase. This means that there is some chance of having increased annual rainfall in the future. The Eastern part of the County; Chemagel, Kapletundo, Rongena/Manaret, Ndanai/Abosi, Siongiroi, Kipsonoi wards are likely to have (0-10) % percentage increase in rainfall meaning near normal change in rainfall. The Western part; Embomos, Ndaraweta, Chesoeni, Silibwet Township, Merigi, Nyongeres Kipreres indicate a future projection of (10-20) % difference meaning above normal increase in rainfall.

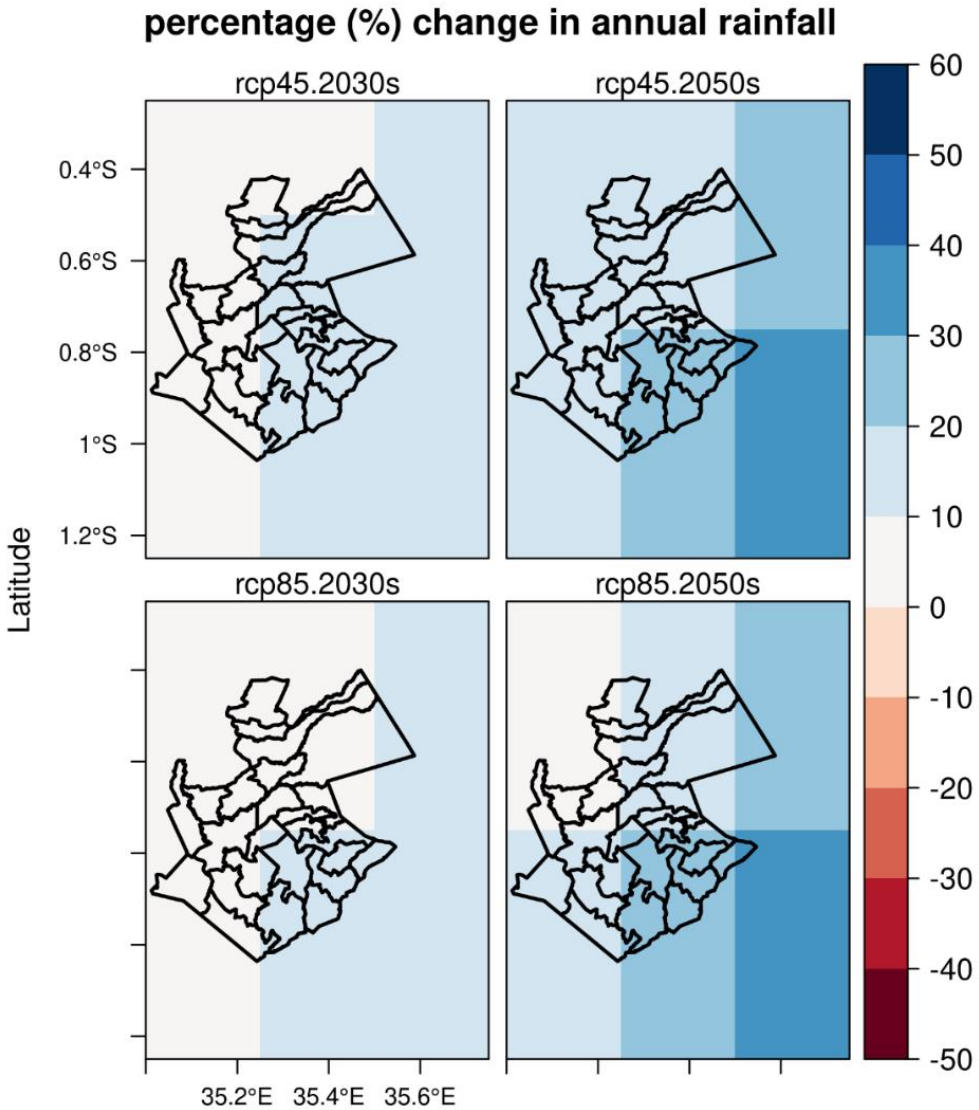


Figure 2-3: Annual rainfall projection 2030 and 2050 using RCP4.5 and RCP8.5 representative concentration pathways scenarios.

The most important rainfall season in Kenya and Bomet is March, April and May; MAM, since 40% of the annual rainfall is received during this season. Further investigation of rainfall

projection in MAM under the same Scenarios RCP4.5 and RCP8.5 indicate that the Eastern part of the County will have increased rainfall while the Western part may normal rainfall by 2030 and 2050.

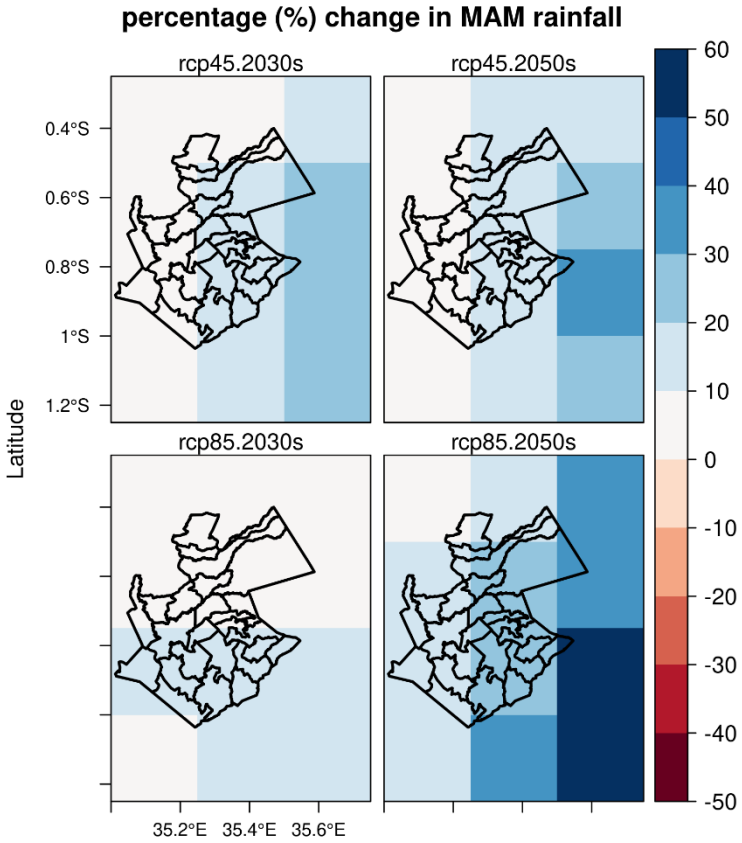


Figure 2-4*:* March April May projected rainfall in Bomet County

The OND season rainfall projection figure 2.6 indicates reducing rainfall in the entire county (-10-10) % meaning, a below-normal situation. The season is projected to be dry. On the other hand, the JJAS projection figure 2.5 indicates a marked increase in rainfall across the entire County. This is in agreement with the already experience of decreasing rainfall amounts in OND and MAM seasons since most of the rainfall is shifting to JJAS.

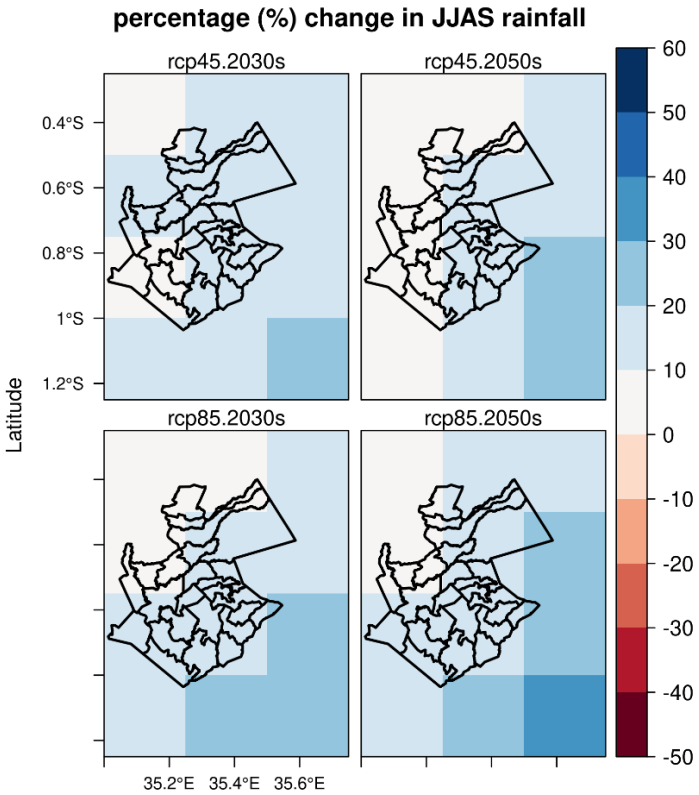


Figure 2-5*:* June, July August and September projected rainfall in Bomet County

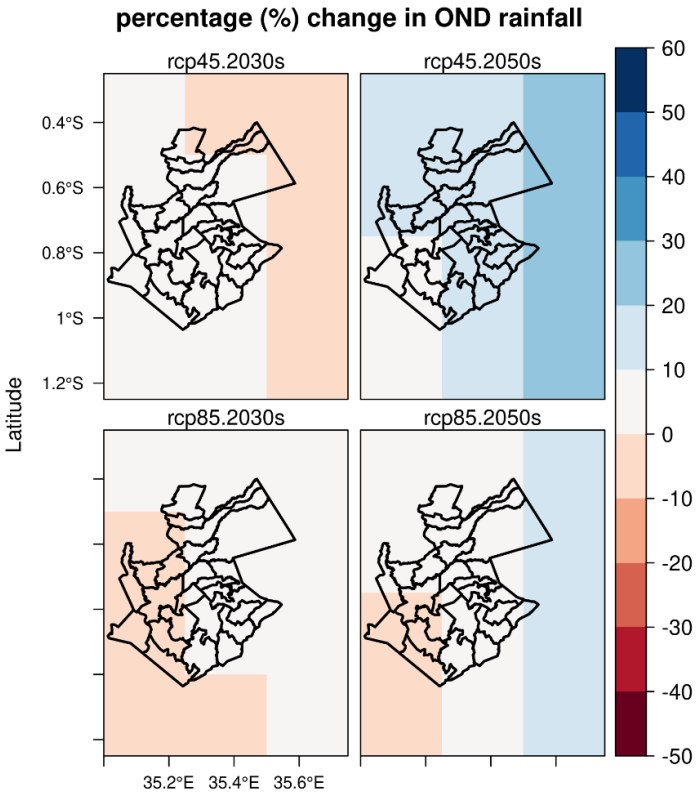


Figure 2-6*:* October, November and December projected rainfall over Bomet County

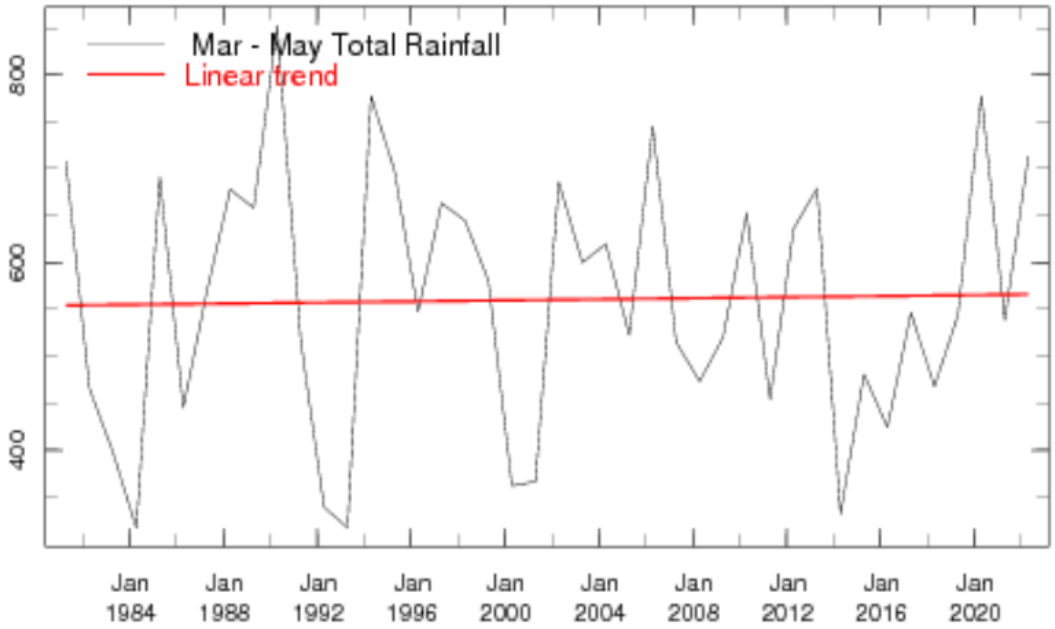


Figure 2-7*:* Rainfall time series since 1981 to 2022 for Bomet County

Rainfall time series indicating no variable in the trend. However, there is a marked increase in the MAM rainfall since 2016 to date. The prolonged dry spells are clearly shown as 1984, 1992, 2000 2014, 2016, 2018, 2019 and 2021. The frequency of prolonged dry spell is increasing as we move into the future.

2.3.2 Temperatures

The temperature in the county range from 12° C to 26° C. The coldest months are usually between June and July, while the hot season falls between December and January.

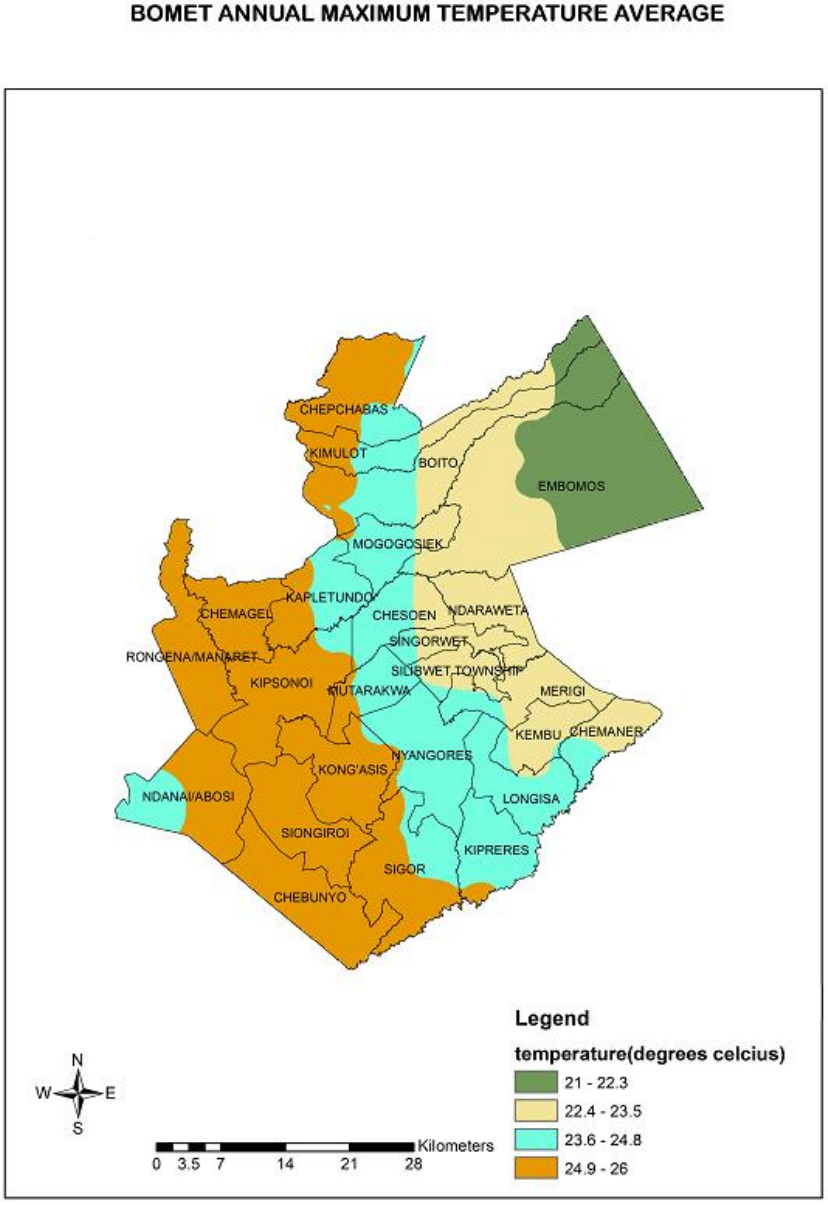


Figure 2-8*:* Bomet County temperature in degrees celsius

Since the early 1960s both minimum (night) and maximum (day) temperatures have been on a warming trend throughout Kenya. Current projections indicate increases in temperature, and recent trends show a marked increase in interannual variability and distribution of rains, with an increase in the number of consecutive dry days and shorter but more intense periods of rainfall resulting in an increase in frequency of floods. Future climate change may lead to a change in the frequency or severity of such extreme weather events, potentially worsening impacts. Increased average temperatures and changes in annual and seasonal rainfall will be felt across key economic sectors, such as agricultural production, health status, water availability, energy use, infrastructure, biodiversity and ecosystem services (including forestry and tourism). Impacts are likely to have disproportionately effects on the poor, women, children and the elderly as such groups have fewer resources to adapt to climatic change and

may therefore become increasingly vulnerable. Figure 2.9 shows the maximum temperature over Kenya 1981 to 2019. The Country experiences very high maximum temperature.

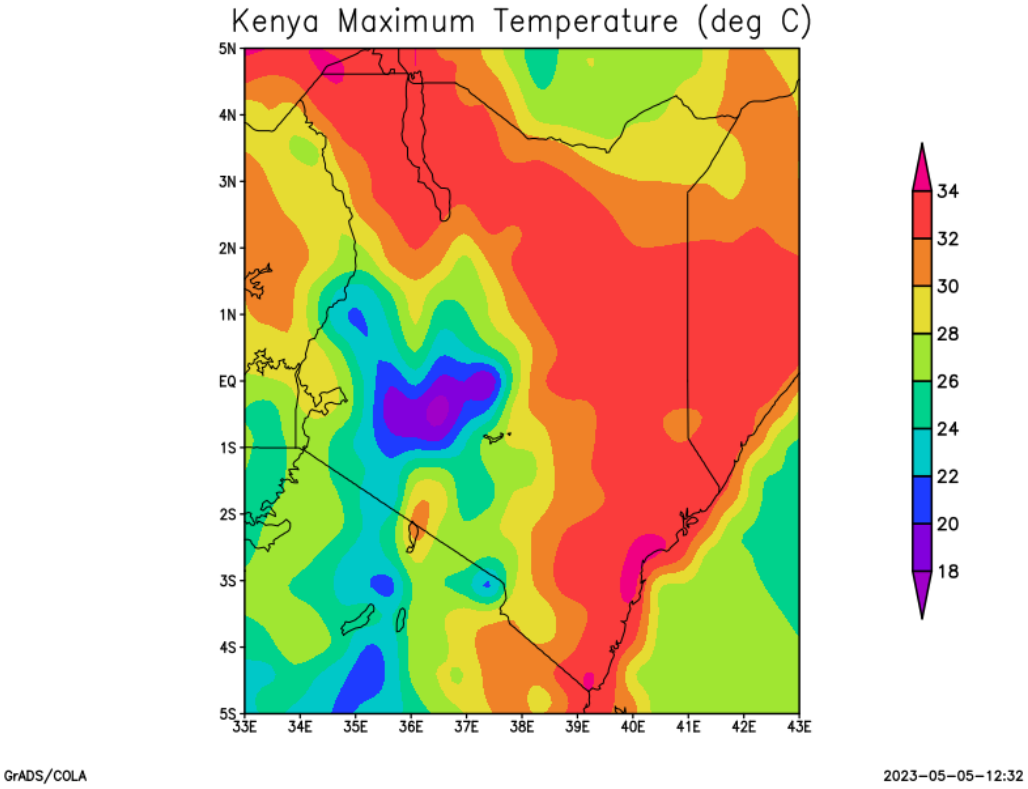


Figure 2-9*:* Long term maximum temperature in degrees Celsius over Kenya from 1981 to 2019.

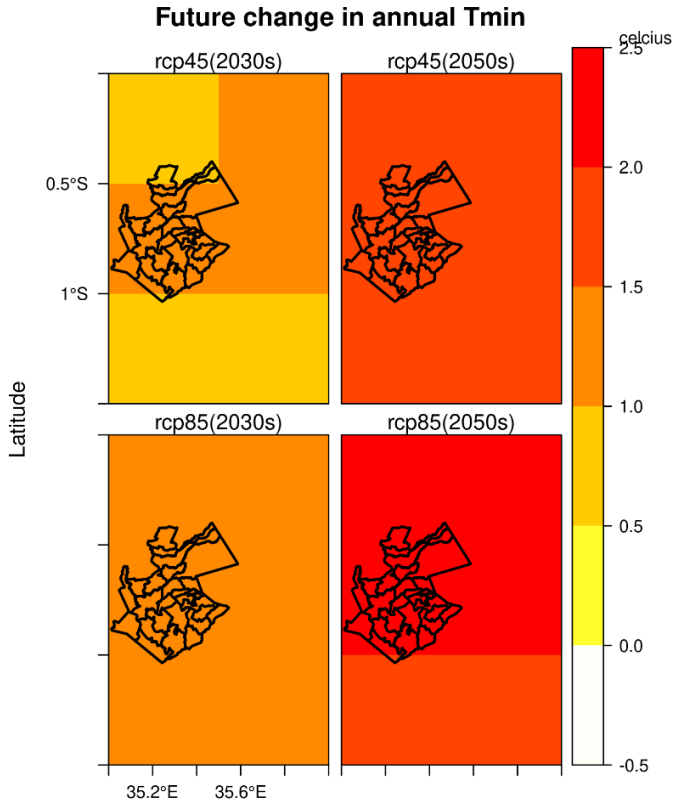


Figure 2-10*:* Projected night time temperatures increase in Bomet County

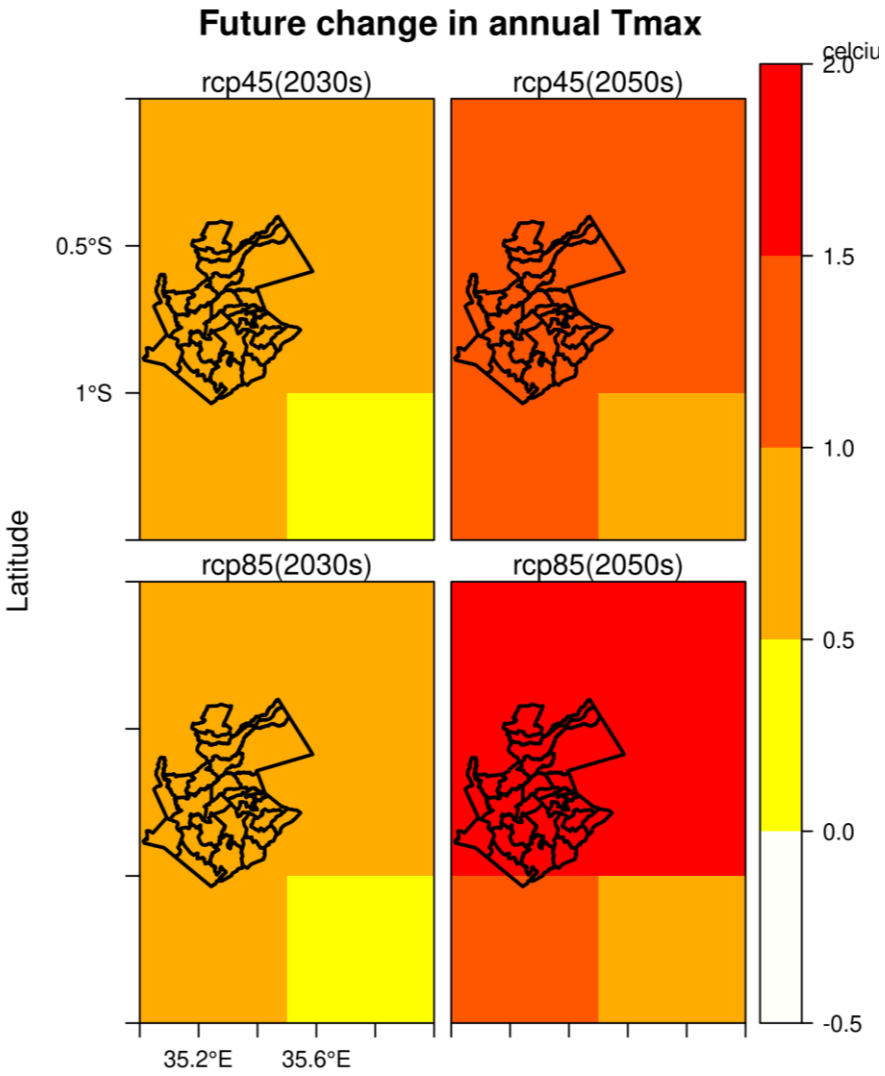


Figure 2-11: Projected day time temperature increase in Bomet County

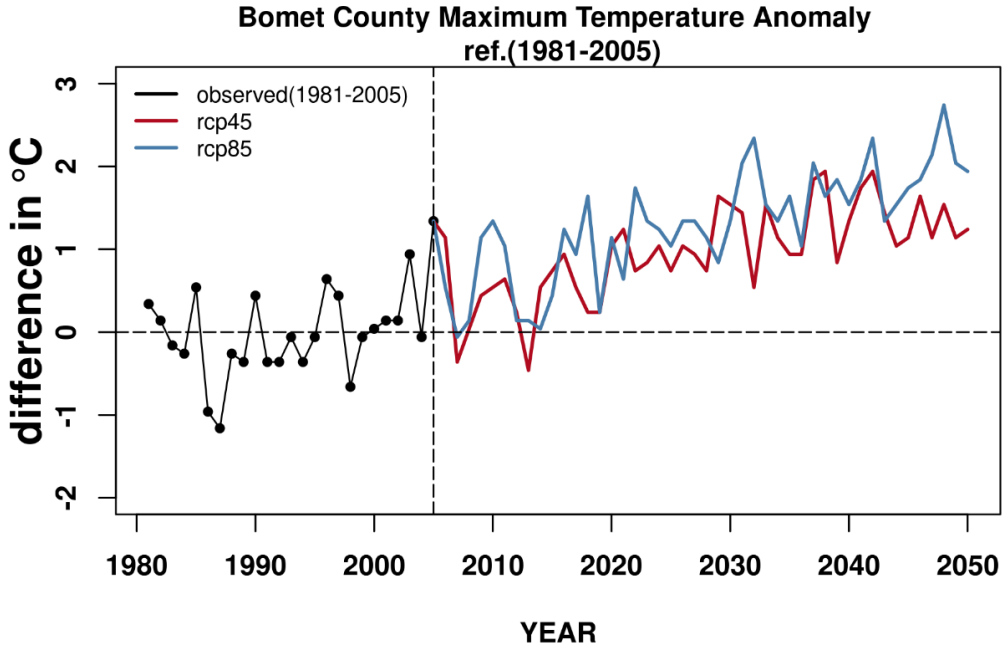


Figure 2-12: Bomet county maximum temperature anomaly (ref. 1980-2005) and projections to 2050

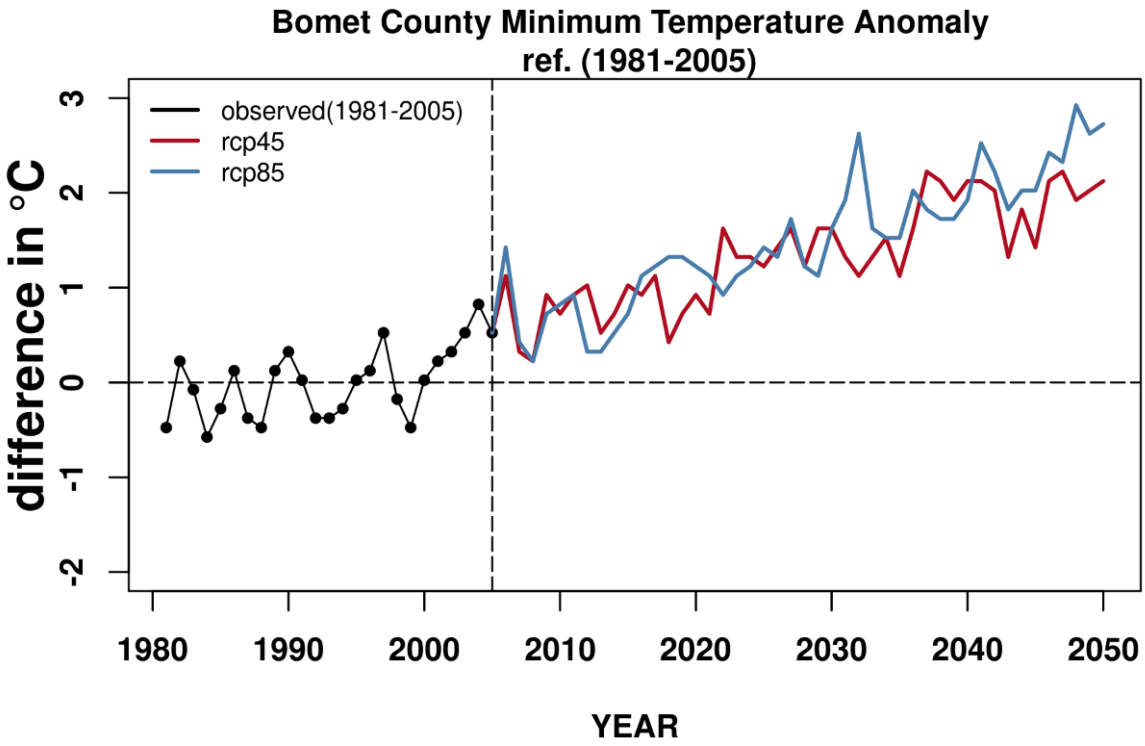


Figure 2-13: Bomet county minimum temperature anomaly (ref. 1980-2005) and projections to 2050

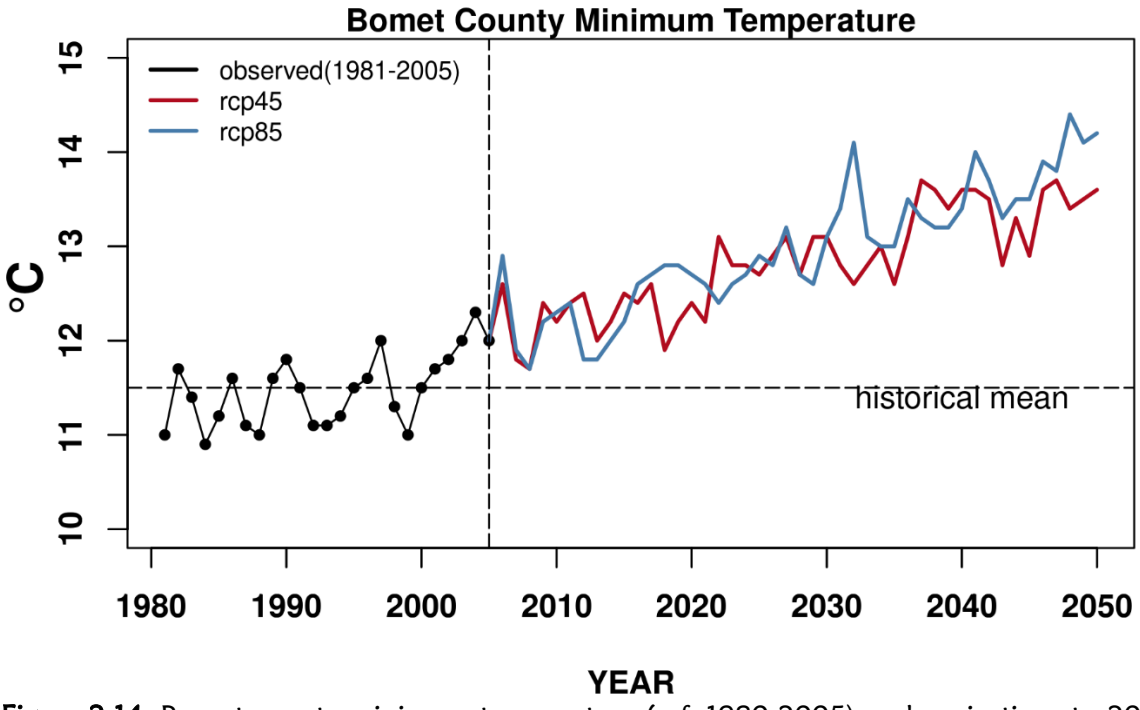


Figure 2-14: Bomet county minimum temperature (ref. 1980-2005) and projections to 2050

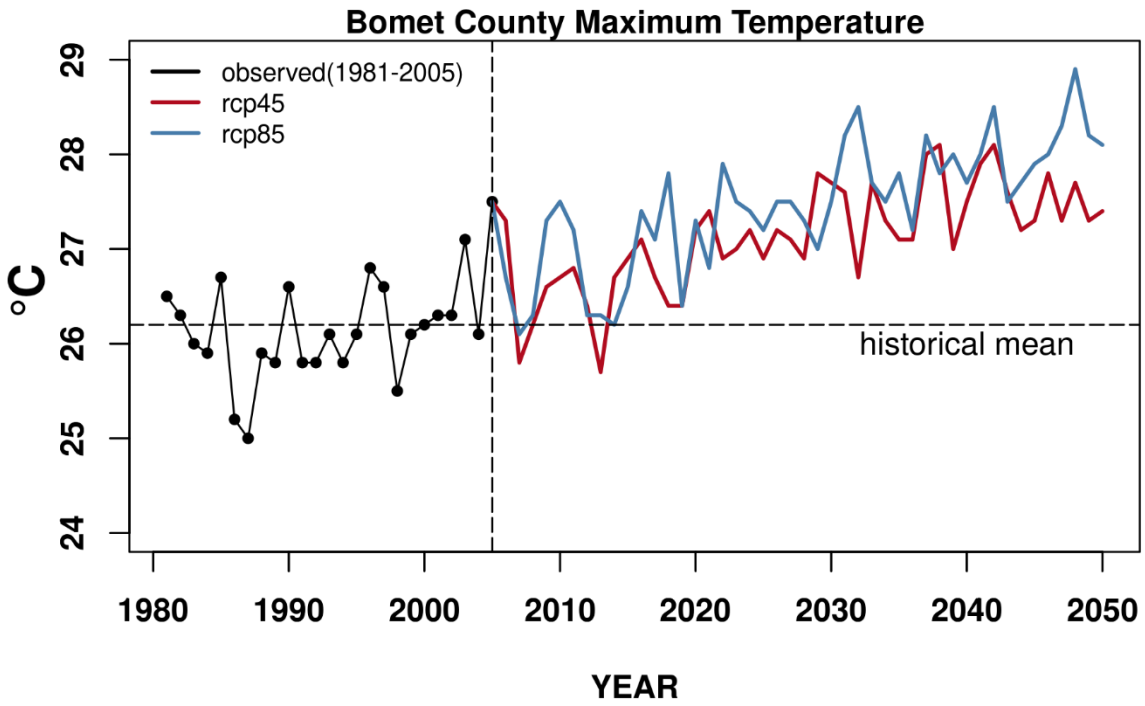


Figure 2-15: Bomet county maximum temperature (ref. 1980-2005) and projections to 2050

2.4 Exposure and vulnerability profiles of the county

2.4.1 Identified climate change hazards/ risk

Hazard refers to the potential occurrence of climate-related physical events or trends that may cause damage and loss. The most common climatic hazards in Bomet county were identified by the communities and community groups. The potential risks from these hazards were also identified. The common hazards include the prolonged dry spell, pest and diseases, frost and hailstones, soil erosion and strong winds. The table below shows the hazards.

Table 2-1: List of hazards per sub -county

Sub-county	Hazards
Bomet East	• Prolonged Dry spell • Pest & Diseases • Floods • Landslides • Soil erosion, • Strong winds, • Lightning and thunderstorm
Sotik	• Prolonged Dry spell • Floods • Strong winds • Hailstones • lightning
Chepalungu	• Prolonged Dry spell • Floods • Weather Variability • Crop pest and diseases

Sub-county	Hazards
Konoin	• Prolonged dry spell • Pest and diseases • Hails stones
Bomet central	• Prolonged dry spell • Crop pest and diseases (maize) • Floods

The hazards are discussed in detail below:

a) Prolonged dry spell

From the community response, Bomet County would experience long rainy season and short dry seasons in the months of Jan, Feb and Jun. Currently the region experiences prolonged dry spells. The residences are now experiencing problems such; scarcity of water, food shortage, crop failure, loss of livestock and low agricultural production. This has led to low income and increase in poverty level in the county.

iii. Pest and diseases

There have been trends of different types of pests and diseases affecting both crops and livestock currently in Bomet. Outbreak of fall army warms, livestock diseases such as ECF that has been a menace in crop and livestock production respectively. Due to this, the residents have experienced low production, high cost of production, livestock death and crop failure in the County. Its impacts have increase food insecurity which in turn cause harm to human health such as malnutrition.

iv. Floods

Prolonged intense rainfall has resulted into inland floods in the low lands in the County More so in Sotik, Bomet Central, and Chepalungu Sub-Counties. From the community, the impact of these included; pollution of water resource resulting into increase in chances of water-borne diseases, damage of infrastructure such as roads and water storage infrastructure, crop damage and displacement of people. Pooling and stagnant water have increase chances of vector-borne diseases such as malaria.

v. Soil erosion

Soil erosion was identified by the community as a hazard which has affected some parts in high-altitude areas like Chepalungu, Sotik, and Bomet East sub-counties. They have attributed soil erosion to loss of soil fertility, damage to animal pasture and siltation of water resources (water pollution). This has led to low agricultural productivity and health problems due to water pollution.

vi. Frost and Hailstones

Frost and hailstones affect high altitudes areas in the county such as Konoin, Sotik and Bomet central. The community indicated that this hazard causes crop damage and low quality and quantity of agricultural production especially tea production in the county. The hazard has been prioritized by the residence of Konoin and Bomet Central.

vii. Strong winds

From the community, it was established that strong winds are a common occurrence in various parts of Bomet County, but the magnitude and distribution vary depending on the terrain and other factors. The most affected areas are highlands areas of Sotik and Chepalungu and plain areas in Konoin. Strong winds in the county have been attributed to crop damage, destruction of building such and human shelter, schools and health facilities among others.

viii. High temperatures

High temperatures were reported in Chepalungu and Bomet East sub counties. The increase in temperatures have affected learning institutions especially afternoon hours. This hazard has been identified and its mitigation proposed to be installation of air fans in schools.

2.4.2 Prioritized hazards

Prioritized hazards in the county include; prolonged dry spell, crop pest and diseases, soil erosion and frost & hailstone. From the data obtained from all the 25 wards, most of the residents prioritized prolonged dry spell as the most hazard. This clearly shows that Bomet County has been highly affected by prolonged dry spell and its impacts. It has been attributed to cause more harm on the various sectors in the region especially agriculture. Prolonged dry spell is the main cause of food insecurity, water scarcity and increase in poverty level among other impacts of climate change in the County.

Crop pest is the second prioritized hazard in the County. The residents have attribute it to cause more impact on food insecurity in the. Reduced yield, crop failure and low income are among the its impacts. In addition, they have been forced to use different ways of controlling it including use of farm chemicals which increases the cost of production.

Soil erosion and frost and hailstones has been prioritized based ward and Sub-Counties. Most responses from Konoin and Bomet Central Sub-County have prioritized frost and hailstones over soil erosion and strong winds. It has been reported in Boito, Chebchabas, Embomos and Kimulot wards in Konoin Sub-County and Silibwet and Singorwet Bomet Central Sub-County. Frost and hailstones have been attributed to caused damage on tea among other crops. It lowers crop yield quality and quantity in the subcounty.

Bomet east, chepalungu and Sotik Sub-Counties have prioritized soil erosion over frost and hailstones. This is because of they are high altitude area in the County. Soil erosion has been reported to cause loss of soil fertility which has a direct impact to agricultural production, land degradation because of gulley development and pollution of water by siltation and sedimentation of water resources.

2.5 Differentiated impacts of climate trends and risks

Climate change vulnerabilities contribute to the risk of the occurrence of climate change impacts. The Bomet County's climate change vulnerabilities manifest in various forms including Low crop production, loss of income, pests and diseases, and loss of livelihoods among others as enumerated in Table below.

Table 2-2. Differentiated Climate exposure and Vulnerability of key groups

Key group	Impacts
Women	• Due to prolonged dry spell, women travel long distances to fetch water

Key group	Impacts
	• Long-time taken to fetch water for household has an impact on their other economic activities. • Cases of gender-based violence are reported because the women shoulder stress from men due to decline in income. • Due to decline in food and nutrition during prolonged dry spell, women are most affected especially during menstrual cycles.
People Living with Disabilities (PWD)	• When there are floods, mobility of the PWDs are affected especially in areas like Chepalungu sub county. • Extreme temperatures affect people who have albinism. • The impacts of the prolonged dry spell e.g. lack of water, decrease in income, lack of pasture etc. affects the PWDs greatly because they lack flexibility to diversify and cope with the change.
Elderly	• The elderly are affected by the lack of food caused prolonged dry spell affecting their well-being due to lack of nutrition. • The floods and other climate change related disasters affected the mobility of the elderly as well as ability to adapt to the changes.
Children	• infrastructure damage e.g. schools by strong winds reported in some parts of Bomet county affects the school going children. • Declines in school attendance, and rising dropout rates especially during disaster like floods. • Impacts of prolonged dry spell affects the children especially those fetches water for the family since a lot of time is spent walking long distances. • It has been proved that, due to diminished income during prolonged dry spell, there are high cases of domestic violence hence, children are the victims. • Children mostly assist during livestock keeping, when the pastures decline, these children are forced to spent more hours looking for pasture.

2.6 Spatial Distribution of Risks

Climate change vulnerabilities contribute to the risk of the occurrence of climate change impacts. The Bomet County's climate change vulnerabilities manifest in various forms including Low crop production, loss of income, pests and diseases, and loss of livelihoods among others as enumerated in Table 2.3.

A vulnerability assessment involved the first five steps in climate change adaptation planning development and is intended to answer the following questions:

Exposure: What climate change effects will a community experience?

Sensitivity: What aspects of a community (i.e., functions, structures, and populations) will be affected?

Potential Impacts: How will climate change affect the points of sensitivity?

Adaptive Capacity: What is currently being done to address the impacts?

Risk and Onset: How likely are the impacts and how quickly will they occur?

The community identified the climate change vulnerability based on the exposure, sensitivity. This was done through a matrix where the group is already affecting the county and will continue to further in the future. The table below shows the summary of hazards and impacts in every sub county.

Table 2-3. Summary of hazards and impacts in every sub county.

Sub-county	Hazards /Risk	Impacts
Bomet East	• Prolonged Dry spell • Pest & Diseases • Floods • Landslides • Soil erosion, • Strong winds, • Lightning and thunderstorm	Scarcity of water, livestock and crop diseases, crop failure, crop damage, reduced production food insecurity, high production cost, loss of fertile soil, water pollution, infrastructure damage and increase in poverty level
Sotik	• Prolonged Dry spell • Floods • Strong winds • Hailstones • lightning	Crop failure and damage, food shortage, water shortage, pest and diseases outbreak, water pollution, soil erosion, House destruction and displacement of people
Chepalungu	• Prolonged Dry spell • Floods • Weather Variability • Crop pest and diseases	Water shortage, Crop failure and damage, food shortage, low pasture, loss of livestock, damage to infrastructure such water pans, soil erosion
Konoin	• Prolonged dry spell • Pest and diseases • Hails stones	Water shortage, low agricultural production, destruction of vegetation, pest and diseases, food shortage, water pollution, livestock loss, low income and increase in poverty level, damage of road network
Bomet central	• Prolonged dry spell • Crop pest and diseases (maize) • Floods	Water scarcity, crop failure and damage, food shortage, loss of animal pasture, outbreak of livestock and human diseases, pest invasion, soil erosion, encroachment of riparian areas, drying of wetlands

(See appendix 1 for detailed vulnerability assessment for each ward)

2.6.1 Assessment of vulnerability to climate change at the community level

A number of studies on vulnerability to climate change have recognized the necessity of local scale exploration of vulnerability to identify adaptation measures.

Local vulnerability measure considers the following characteristics to convey information on diverse natural environments and heterogeneous socio-economic structure at multiple scales which lacks in aggregate vulnerability indices.

Scale: Many recent vulnerability studies argue that the vulnerability assessment depends critically on the scale of analysis. The vulnerability assessment at the local scale becomes critically important not only because of the bio-physical environmental difference of locations, but also because of the socio-economic contextual differences at the local level. For example, even if we attempt to measure vulnerability to climate hazard (i.e. flood), heterogeneity of locations even within a county or specific region is often responsible for differential response (i.e. coping capability) to that hazard. Furthermore, within Kenya, heterogeneity of socio-economic contexts such as institutions, population, social network and culture, may affect the "local" vulnerability to climate change.

Dynamics. Vulnerability assessment requires a dynamic point of view (Frank et al., 2011). Individual perception and accumulated knowledge of climate change that evolves over time results from learning through the past experiences of household's response to climate change, their attitudes, values, culture and norms. In fact, it has been shown from the number of behavioural studies that individual awareness is one of the critical factors that determine local vulnerability (Vogel et al., 2007). For empirical studies, it is important to characterize individual awareness in a continuously changing environment in an adverse manner.

Effective adaptation policy. One of the ultimate goals of assessing local level vulnerability to climate change is to implement effective adaptation policy and allocate the development assistance effectively. Individual households have been recognized as critical units in designing and implementing effective policy since they play a crucial role bridging between the macro-economic situation and individual welfare.

Diversity. By focusing on micro level unit of analysis such as household or community ecosystem, it becomes feasible to capture the diversity of the natural environment of communities and their socio-economic heterogeneity (Acosta-Michlik et al., 2008).

In order to create local vulnerability measures that consider above four characteristics, it is necessary to consider measuring the Bomet county vulnerability by different sectors. In fact, through various county case studies and projects, we find that sector specific or multiple sector local vulnerability and adaptation measure have been identified at various locations. Practitioners are in great need of the sectoral index that can be applied systematically at the county level. The most commonly examined sectors by Bomet county vulnerability assessment studies include agriculture, water, forestry and health.

2.6.2 Vulnerability assessment per sub county

The vulnerability assessment was done per subcounty as shown in the table below.

Table 2-4: Vulnerability assessment matrix

Sub-County	Prolonged Dry Spell	Floods	Pest and Diseases	Soil Erosion	Landslide	Strong Winds	Hailstones and Frost	Total	Overal Vulnerability
Bomet East	3	1	2	2	1	1	1	11	
Bomet Central	2	2	2	1	1	1	2	11	
Konoin	2	2	2	1	1	1	2	11	
Chepalungu	2	2	3	2	1	1	1	12	
Sotik	2	1	2	2	1	2	1	11	
Total	11	8	11	8	5	6	7	56	

Key		
>10		High
5 to 9		Medium
<5		Low

As shown in the table, Bomet county has been affected by climate change with Chepalungu subcounty being more vulnerable than the other Sub-Counties. The participants indicated that pest and diseases was the hazard contributing to high vulnerability in the sub-county. The source of livelihoods in this sub county is majorly livestock keeping and crop farming. Also, prolonged dry spell and Floods are among the hazards which increased vulnerability in the sub-county. It is worth to note that, the exposure and severity of the hazards that guided the rating by the community.

Others sub counties had similar vulnerability rating, with prolonged dry spell, floods, pest and diseases as hazards which had contributed to vulnerability. Moreover, hailstones and frost, have low effects on all the sub-Counties except Konoin and Bomet central. This can be attributed to tea plantation being is a source of livelihood in these areas.

2.6.3 Sectoral climate change vulnerability

The community members listed the community resources/ livelihoods and assigned values of 0 to 3 (0 -no impact/positive impact; 1- low impact, 2- medium impact and 3 – High impact). The participants had to have a consensus on the values guided by the severity and exposure. The values of each resource were added and overall vulnerability index obtained for the sectors as shown in the table below.

Table 2-5: Sectoral climate change vulnerability matrix

Sector	Prolonged Dry Spell	Floods	Pest and Diseases	Soil Erosion	Landslide	Strong Winds	Hailstones and Frost	Total	Overal Vulnerability
Crop farming	3	2	3	2	1	2	2	15	
Livestock farming	3	1	2	1	1	1	1	10	
Water	3	1	0	2	1	1	0	8	
Health	1	2	1	1	1	1	1	8	
Infrastructure	0	2	0	1	2	2	0	7	
Forestry	2	1	1	1	1	1	1	8	
Total	12	9	7	8	7	8	5	56	

Key		
>10		High
5 to 9		Medium
<5		Low

As shown in the table, agriculture is the most vulnerable sector to climate change in Bomet County with crop farming highly affected than livestock farming. Climate change has a medium impact on water, health, infrastructure and forestry in the county.

Prolonged dry spell affects all the identified sectors in the county. In regions like Konoin, and Bomet central sub counties whose main source of livelihoods are tea farming and employment in tea factories are most vulnerable due to prolonged dry spell since the yields or tea production decreases. Floods, soil erosion, strong winds, pest and diseases, landslide, hailstones and frost have medium impacts on all the sectors.

The impacts on main livelihood and economic sectors are discussed below:

2.6.3.1 Agriculture

Bomet County is endowed with vast areas of fertile land and high rainfall. Agriculture is the main economic activity with over 80% of the total population engaging in crop and livestock production. The sector also provides raw materials to agriculture-based industries in the county and therefore stimulates off-farm employment as well as the use of local resources.

Agricultural production is already vulnerable to the vagaries of climate in the county because crop production there is rainfed, with cropping cycles defined by the onset of the rains. Farmers typically lack capital inputs, finances and technical skills to use improved farming practices or agricultural inputs, which leaves them less resilient to the impacts of a changing climate. Farmers are opting to plant lower-yielding traditional maize varieties or millet throughout the year rather than risking a loss to diseases such as maize lethal necrosis disease (MLND), pests such as the fall armyworm and/or droughts affecting the higher-yielding certified varieties.

There are numerous climate related hazards in Bomet County that have been compounded by various changes in weather and climate over past decades. The impacts of these changes are however not uniform across all agricultural value chain commodities. Climate vulnerability involves socio-economic factors that influence people's ability to cope up with.

ix. Crop farming

a) Tea

Tea farming is mostly practiced in Sotik and Bomet Central, a few in Konoin and Chepalungu in the county. Recent changes in temperatures, and the more frequent occurrence of frost and hailstorms, have reduced yields and challenged the profitability of tea production. Furthermore, cold temperatures limit workers' productivity, reducing daily yields for farmers. Temperature variability has the greatest impact on yields, particularly during the dry spells. A warm, wet season is ideal for production, but these are becoming rarer as rains become more erratic.

Effect of unpredictable rainfall

Rain has become unpredictable in the recent years and has affected tea farming plans. The residents reported that they normal rainfall pattern have greatly changed and is unpredictable. Tea farming requires proper planning in accordance with the rainfall pattern to achieve high and quality yields. Therefore, with the current situation of unpredictable rainfall, tea farmers in the area have been greatly affected. It has led to uncertainty on when to apply fertilizer, weed management, changes in tea plucking cycle which then result into low yield hence low income. Furthermore, it has affected proper planning of planting new seedling.

Effects of prolonged dry spell

Tea farmers have been affected by prolonged dry spell in the county. Drought has led to very low tea yields and sometimes no plucking of tea at all leading to low income during this season. According to Cheserek et al, (2015) droughts decrease the tea yield because the low moisture content decreases photosynthesis, growth and plants survivability. This agrees with response from the residents. They reported that prolonged dry spell has led to low yields, drying tea plants especially the young and pruned and pests such as mites which then affect the quality of the yields. Farmers have attributed this to low income and increase in poverty levels.

Effect of Hailstorm and Frost on Tea Yields

This hazard has been prioritized much in Konoin and Bomet central Sub-Counties where tea is grown on large and small-scale. Hailstorms damages green tea resulting to very low or no yield at all. Hail would completely strip the tea shrubs of leaves and sometimes damages the bush stems depending on storm intensity. According to TBK (2014), hailstorms destroyed tea bushes in Ndaraweta, Singorwet, Mugango and Kiramwok locations in August 2013 where some 12,890 Kgs of green tea were lost. Tea farmers had to wait for 2–3 months for the tea bushes to recover from the impact of the hailstorms before again starting to pick their tea leaves. Other effects of hailstones included damage of young tea and reduction of leaf quality for a period of at least three months depending on the intensity of the hailstones. From the findings,

Frost effects have been experienced much in Konoin and Bomet Central sub-counties. From the respondents, Frost has been attributed to low yielding of tea in the county. This is in agreement with Elbehri (2015) who found out that frost significantly reduces the yields of tea up to 30% because of withering of tea leaves. After a frost event, the community reported that tea cannot

be harvested for a period of time ranging from weeks to months. This is in agreement to the study by (Bore, 2015) who found that the crop cannot be harvested for up to two and three months from the time the frost occurred.

x. Maize

Maize farming is a significant agricultural activity in Bomet County, with the crop being the main staple food for most households in the region. It is practiced in all sub-counties, with the highest production being in Bomet East, Konoin, and Bomet Central sub-counties. Climate change has had significant impacts on maize farming in the County. From the respondents, it has led to reduced yields, low-quality maize crops, increase production cost reduced income for farmers and furthermore increasing food insecurity in the county.

Climate change has led to prolonged dry spell in Bomet County. This has resulted to water scarcity, and the maize crops have been unable to get enough water to support growth and development, leading to lower yields and crop failure.

Flooding has been attributed to soil erosion reducing soil fertility and crop damage due to pooling. This has resulted into low yields and poor quality of production.

Changes in temperature and rainfall patterns have led to an increase in the incidence of pests and diseases, such as stem borers, armyworms, and maize streak virus. This has caused maize crop damage and failure. Furthermore, farmers have been forced to use pesticides and insecticides which makes cost of production to be high consequently lowering income.

Farmer have also experienced changes in maize growing seasons. Unpredictable weather patterns have made it difficult for farmers to plan for the maize farming season. Farmers may plant maize when there is inadequate rainfall, leading to crop failure. Alternatively, they may miss the planting season altogether and lose the opportunity to grow maize.

xi. Banana

Banana has been gaining importance for food security and livelihoods of farmers in Bomet County. In terms of geographical coverage, banana production is well spread across all five sub-counties. It characterized by small scale, mixed, subsistence farming systems in the areas of Sotik Sub-County, Bomet Central Sub-County including the areas of Silbwet, Tenwek, Cheptalal, Ndaraweta, Konoin Sub-County including Kimulot, Chebangang and Kapkoros. Large-scale, commercial mono-cropping farming systems are only found on Nogirwet.It is estimated that 61% of the total population are engaged and this is due to the fact that the crop is resilient to dry spells, pests and diseases. However, the crop is affected by extreme weather conditions. Prolonged drought lowers its yield quality and quantity, it also leads to crop failure upon planting.

xii. Irish potato

Irish potato is characterized by large-scale commercial farming systems in Bomet Central including areas of Kipsonoi, Kiplelji, Silibwet, Tenwek. In the areas of Sotik and Konoin Sub-Counties and Gelegele, it is characterized by small-scale, mixed cropping (tomato and livestock such as dairy) systems.

Effects of dry spell and moisture stress

Dry spell/moisture stress affects some parts of the commercial, large-scale farming systems (Kiplelji, Kembu,) and parts of the small-scale, subsistence, mixed farming systems (Gelegele). Dry spell leads to soil compaction which makes tilling the land more difficult. This consequently leads to high cost of land preparation due to the use of machinery such as subsoilers. This stress also leads to the emergence of pests and diseases such as whiteflies affecting the leaf surface area, lowering quality and quantity of the yields.

Effects of intense rain.

Intense rain often leads to high infestation of pest and diseases such as bacterial wilt, potato blight. These pests are expensive to control, and the high incidence of diseases. Furthermore, farms in sloping areas such as Ndarawetta, Merigi are more affected by intense rain due to the high rate of leaching and erosion leading to poor yields. The lowlands of Bomet East and Sotik are characterized by clay soils getting logged thus affecting the productivity of irish potato.

xiii. Sweet potato

Sweet potato is a heat loving, drought tolerant food crop that has widely been accepted in Bomet County. It is mainly grown in the lowlands of the county: Chepalungu, Bomet East, Sotik and parts of Bomet Central Sub-Counties.

Prolonged dry spell/moisture stress affect small-scale mixed, subsistence farming systems in Chepalungu Sub-County, which includes areas of Chebunyo, Kaboson, and Sigor. Land preparation, especially in the lowland areas which predominantly covered with clay soils, becomes more difficult due to hardpans. This mostly affects farmers that use simple hand tools compared to those using machinery such as sub soilers. Because of this, farmers often have to delay planting which results in low production and low-quality tubers that break during harvesting. Poor quality produce fetches low prices and increases the cost of processing.

xiv. Livestock farming

Livestock keeping is a common practice in most of the sub-counties in Bomet County, with many households keeping various types of livestock for both subsistence and commercial purposes. However, some sub-counties such as Sotik, Chepalungu and Konoin in the County are more known for livestock rearing than Bomet East and Bomet Central. Farmers practice dairy farming, poultry keeping, sheep and goat rearing and a few practicing bees keeping.

According to the community, they have experienced challenges on livestock farming due to climate change in the county both in terms of their health and productivity. Scarcity of water due to prolonged dry spell have led to pasture loss resulting into low dairy production and even livestock loss. As temperatures rise, animals have become more susceptible to heat stress, which has led to reduced growth rates, lower milk yields, and increased risk of disease such as ECF. Flooding in some parts of the county, have direct impact on the survival and well-being of livestock. The respondents reported that it has caused pasture destruction due to pooling and soil erosion. Changes in temperature and precipitation have been attributed also to increase incidences of distribution and abundance of pests and diseases that affect livestock, as well as the quality and availability of the plants they eat.

Local poultry are adversely affected by dry spell, especially in the hot and dry agro ecological zones of Chepalungu Sub-County (Chebunyo, Kaboson, Sigor) that practice small scale, subsistence, mixed farming systems as they are vulnerable to inadequate feed and water, and

to increased incidence of diseases such as Newcastle disease. Drought also leads to high prevalence of external parasites such as flies and mites. This leads to a decline in production and/or to stock loss. Intense rainfall leading into flooding damage housing and to storage facilities compromise poultry health and survival, as there is increased incidence of diseases such as fowl typhoid prevalence of the endo parasites increase. With these, cost of production is high accompanied low output and income to farmers. This is pronounced in the small scale, subsistence, mixed farming systems in the Konoin, Bomet Central and parts of Sotik Sub-Counties.

2.6.3.2 Water resources

Bomet County has several water resources that support various economic activities, including agriculture, livestock keeping, and domestic use. They range from rivers, dams water pans, springs and boreholes. Water resources have been exposed to extreme events of prolonged dry period and floods which are the main events of climate change. This has affected water quality and its availability in Bomet County.

Climate change has led to reduced rainfall and prolonged dry spell in Bomet County, which directly impact the amount of water available for agriculture domestic, and industrial use. Reduced water availability has led to water scarcity. Reduced in down pour, increased in evapotranspiration and prolonged periods of dry spell has led to drop of water level in rivers such as Kipsonoi, Nyangores, Chemosit and Amalo, sections of river banks have been turned into farms by some of the opportunistic residents. With this, it has also led to increase in water pollution. Some of the springs have dried up such as in Sigor and Chebunyo wards in Chepalungu Sub-County. The respondents attributed this to cause water scarcity which then has contributed to increase in demand of water in County.

Frequent and severe weather events such as floods and Prolonged dry spell in the county. have led to rapid fluctuations in water availability, which can make it challenging to plan for and manage water resources effectively.

Changes in precipitation patterns, temperature, and runoff has an impact on quality of water resources in Bomet County. Increased runoff during heavy rainfall events leads to erosion, sedimentation/siltation of water pans as reported in Longisa ward. these has led to pollution of water sources increasing chances of waterborne diseases.

Stressors	Climate change risks
• Prolonged dry spell • Increase heavy rainfall • Increased evaporation and evapotranspiration	• Reduce in water availability • Increase in water variability • Water pollution • Increased demand for water

2.6.3.3 Human health

Bomet County is vulnerable to several health risks related to climate change, including heat-related illnesses, vector-borne diseases, water and foodborne illnesses, respiratory illnesses, and mental health issues. Climate change health risk are as follows;

Quality and availability of water and food has been a problem and have been prioritized by the respondents, this has led to an increase in water and foodborne illnesses such as malnutrition, cholera, typhoid fever, and diarrhea. Food insecurity, a function of climate-

induced crop loss/failure, can leave poor households malnourished due to food insecurity, further increasing their vulnerability to illness. Flooding, particularly due to more intense single rainfall events, can increase contamination of drinking water, which in turn increase risk of waterborne diseases. In march 2015, cholera outbreak in Bomet town killed two people and forced all the city's hotels to close.

Increase in temperatures due to climate change led to an increase in heat-related illnesses such as heat exhaustion, heat cramps, and heat stroke. This can particularly affect vulnerable populations such as the elderly, children, and those with pre-existing medical conditions.

Climate change can alter the distribution and prevalence of vector-borne diseases such as malaria, dengue fever, and Lyme disease. Changes in temperature and rainfall patterns can impact the geographic range and abundance of disease-carrying mosquitoes and other vectors. Pooling and stagnant water due to heavy single rainfall increases chances of vector borne diseases such as malaria due to availability of breeding zones of mosquitoes.

Climate change can worsen air quality due to increase in air pollution (dust) as reported in Silibwet and Singorwet in Bomet central, leads to an increase in respiratory illnesses such as asthma, chronic obstructive pulmonary disease (COPD), and lung cancer. This is because climate change can exacerbate the formation of smog and increase the frequency and intensity of wildfires.

Climate change has also impact mental health, particularly through its effects on natural disasters, displacement, and economic insecurity. Climate-related stressors such as droughts, floods, and storms can lead to anxiety, depression, and post-traumatic stress disorder (PTSD).

Stressors	Health Risks
• Rising temperatures • Increase heavy rainfall • Prolonged dry spell	• Increase food insecurity and malnutrition • Heat-related illnesses • Vector borne diseases • Increased risk of food and waterborne disease, including malaria and cholera • Respiratory illnesses • Mental health

2.6.3.4 Infrastructure

Bomet County has a diverse range of infrastructure that supports the economic, social, and cultural development of its people. They include roads, health facilities, education, water and energy. This sector is also vulnerable to climate change hazards in the County.

Bomet County has experienced more frequent and intense rainfall events in recent years, leading to increased flooding. From local response, this has resulted in damage to roads since most of the roads in the county are seasonal, bridges, and other transportation infrastructure, as well as buildings and other structures such as human shelter. For example, in 2018, heavy rains caused a bridge in Longisa town to collapse, cutting off a major road link in the area.

Bomet County has also experienced an increase in landslides in recent years, particularly in areas with steep slopes and unstable soils. This has resulted in damage to roads, buildings, and other infrastructure in the region. For example, in 2017, landslides caused by heavy rains blocked several roads in the area, including the Narok-Bomet highway. Drought: Climate change can

also result in more frequent and prolonged droughts in Bomet County, which can impact infrastructure such as water supply systems and agricultural production.

Damage to buildings and structures: Frequent and intense storms and other extreme weather events due to climate change, have damage buildings and other structures in Bomet County. For example, in 2018, a severe storm damaged several buildings, including schools and health facilities, in the region. Strong winds have been known to cause damage to roofs of buildings in Bomet County, particularly on buildings with weak or poorly maintained roofing materials. In 2019, strong winds caused damage to the roof of a school in Bomet, resulting in the closure of the school.

Damage to electrical infrastructure: Strong winds was reported to cause damage to electrical infrastructure (power distribution lines) in Bomet County. For example, in 2019, strong winds caused power outages in several parts of Bomet County, with some areas experiencing power outages for several days.

Damage to trees and vegetation: Strong winds can cause damage to trees and other vegetation in Bomet County, leading to fallen trees and branches that can cause damage to buildings and other infrastructure, as well as block roads and other transportation routes. For example, in 2021, strong winds caused a tree to fall on a house in Bomet, causing significant damage.

2.6.3.5 Forestry

Increased frequency of wildfires: Climate change has led to an increased frequency and intensity of wildfires in Bomet County. This has led to forest destruction and the release of carbon into the atmosphere, contributing to further climate change.

Climate change has had a significant impact on forestry in Bomet County such as tree migration, forest fires, pests and pathogens, biodiversity loss, and carbon storage. Here are some of the ways in which climate change has affected forestry in the region:

Forest degradation: Climate change has led to increased temperatures, which, in turn, have led to forest degradation due to increased evapotranspiration and dry conditions. This has led to a decline in forest productivity, soil fertility, and biodiversity.

Pests and diseases: Climate change has led to the emergence of new pests and diseases that affect forest health. For example, the outbreak of the Pine Bark Beetle in Bomet County has been attributed to climate change.

Water scarcity: Climate change has led to increased water scarcity, which affects forest growth and productivity. Forests are important for water regulation, and reduced forest cover can lead to a decline in water availability, especially during the dry season.

2.7 Climate Change Hazard Maps

Participatory Hazard Mapping is one of the most common tools used to map a specific area, identify general infrastructures, houses and livelihood assets and weigh their exposure to hazards that are changing or introduced with climate change. It was found that the participatory nature of the tool makes it an effective tool to tap climate risk information and identify potential risks across locations. The women, youth and PWDs participated during the identification of hazards. The maps depict the type of hazard, its location, route/influence, its potential extent, and resources that are exposed to it (such as houses, springs, livestock, roads and bridges, schools, or market places). Hazards were marked using a cross or another well-

known symbol. GIS based land information makes participatory or community-based hazard mapping more accurate and effective. The community was asked to draw the map of their ward and map all the community assets and hazards identified above. These maps were further processed using ArcGIS to produce more accurate georeferenced map. The Bomet county hazard map is shown in Figure 2.16. while for the sub-counties are shown in Figures 2.17-2.21.

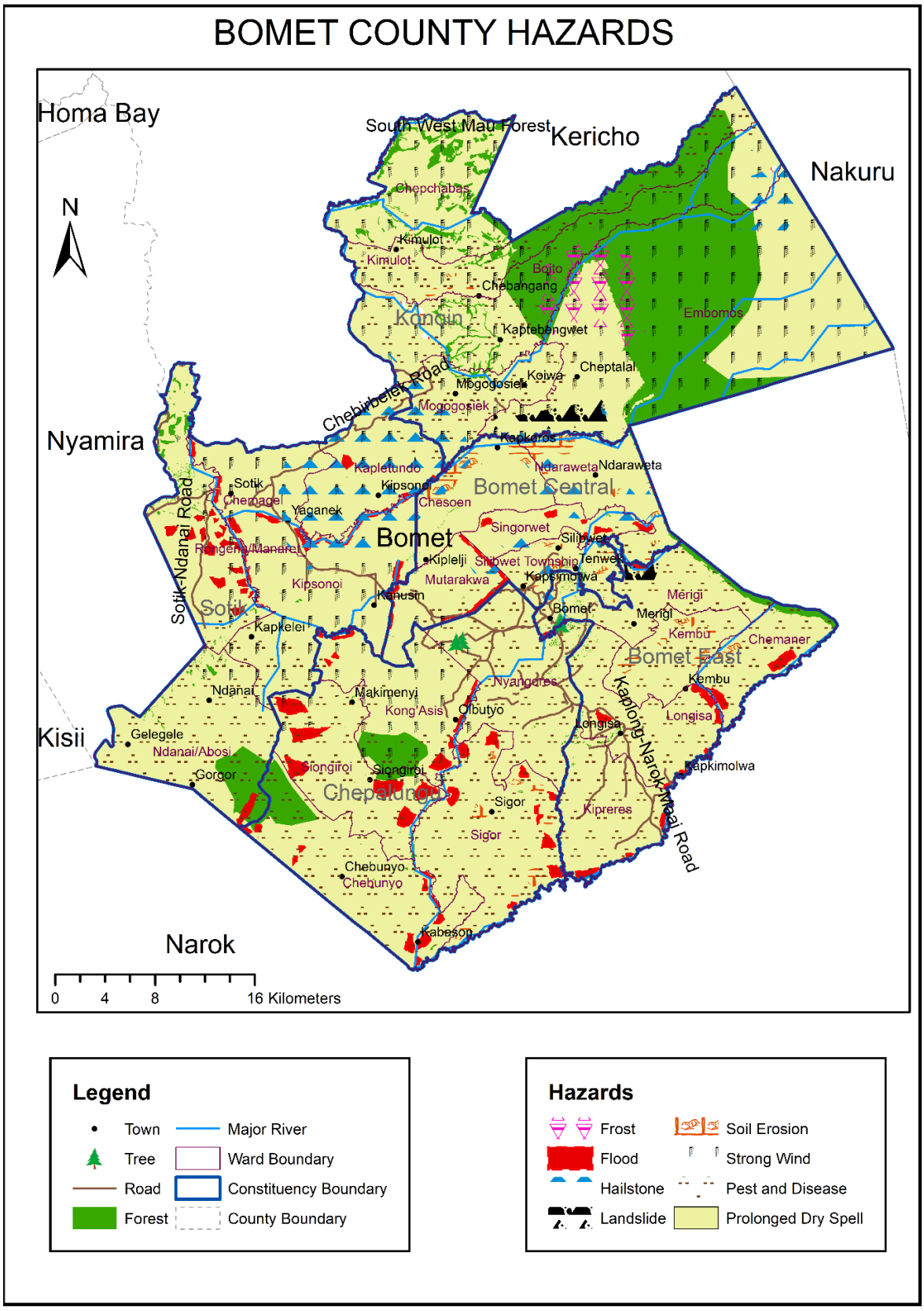


Figure 2-16. Hazard map for Bomet county

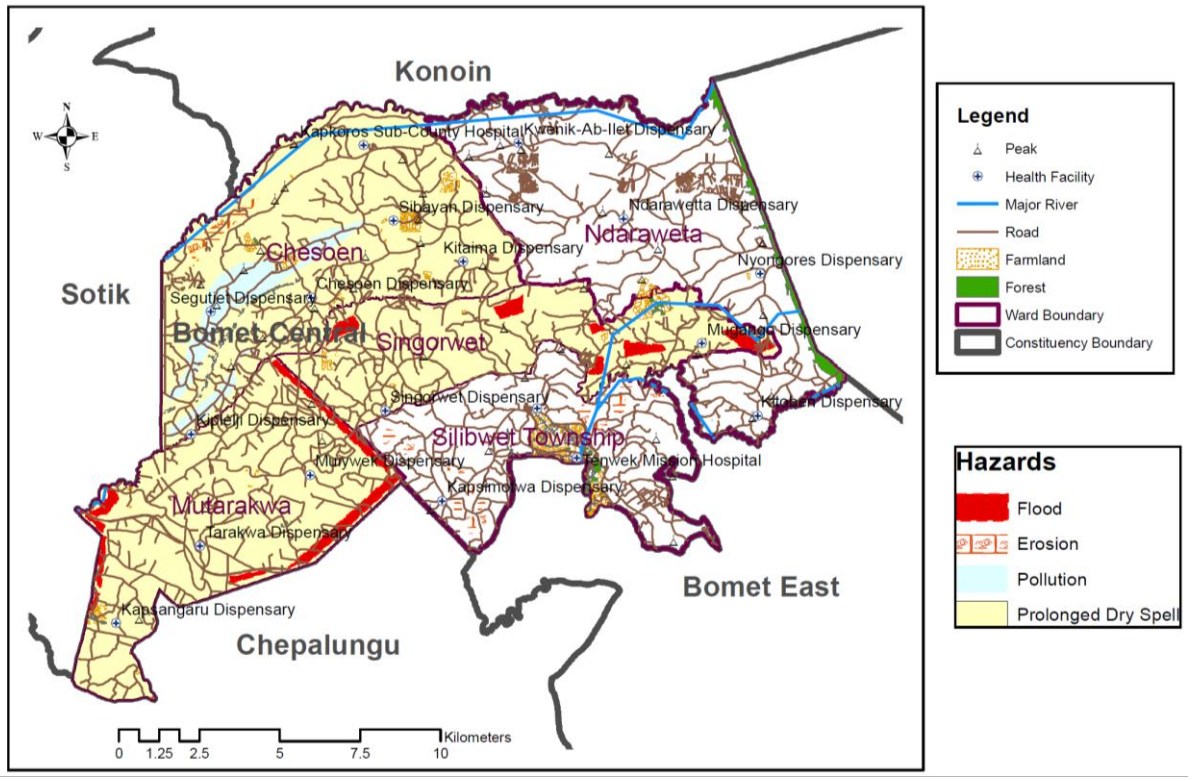


Figure 2-17: Hazard map for Bomet Central Sub county

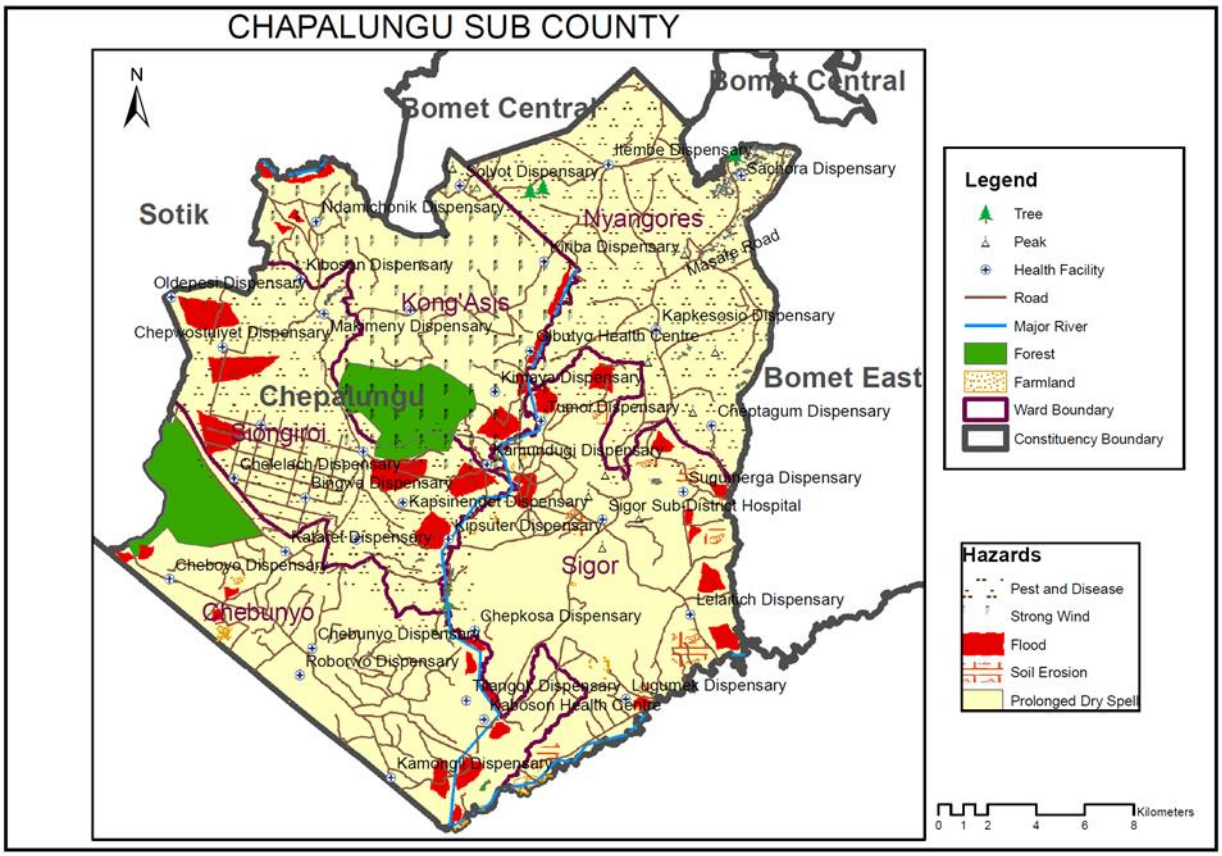


Figure 2-18*:* Hazard map for Chepalungu sub county

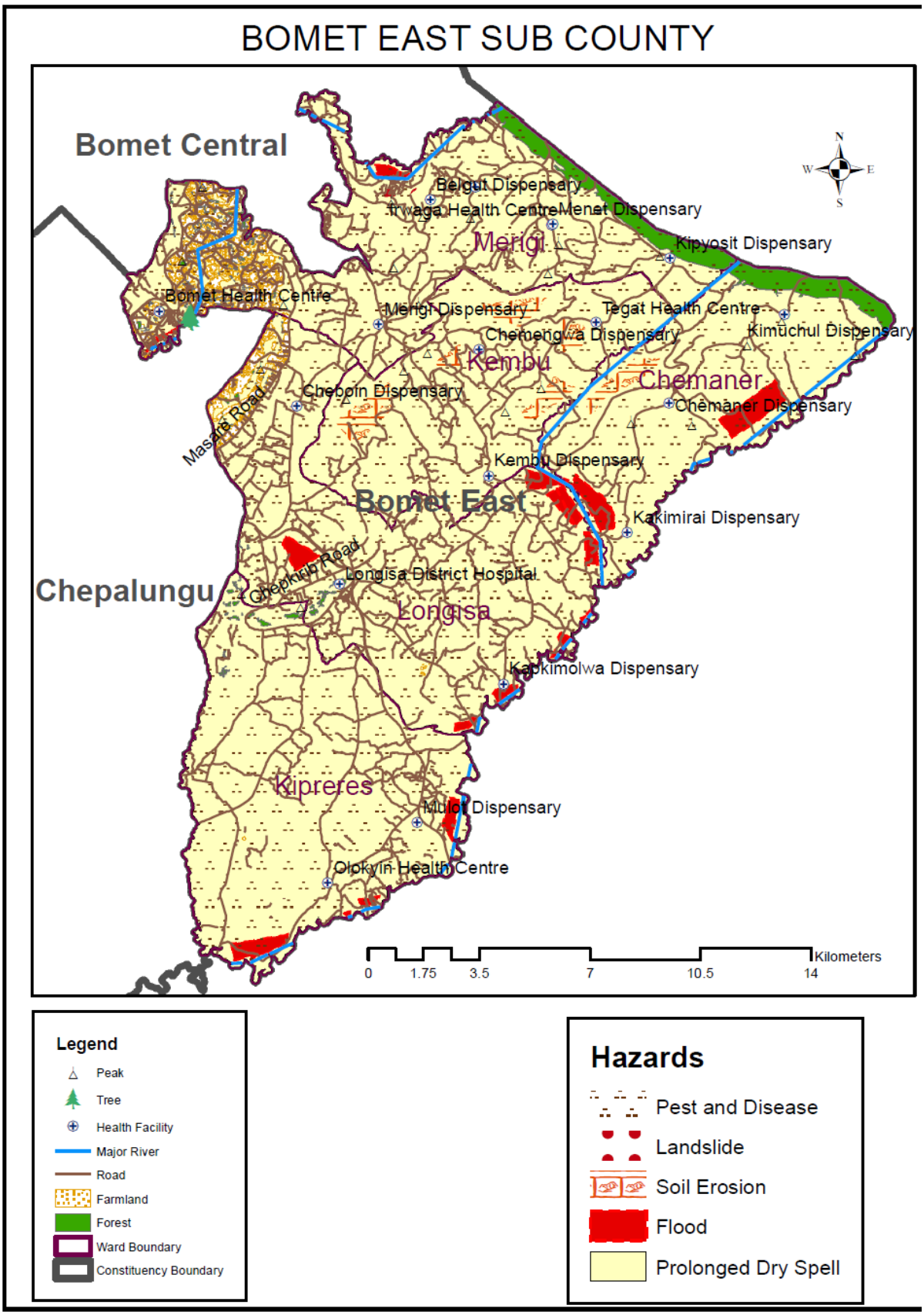


Figure 2-19. Hazard map for Bomet East Sub county

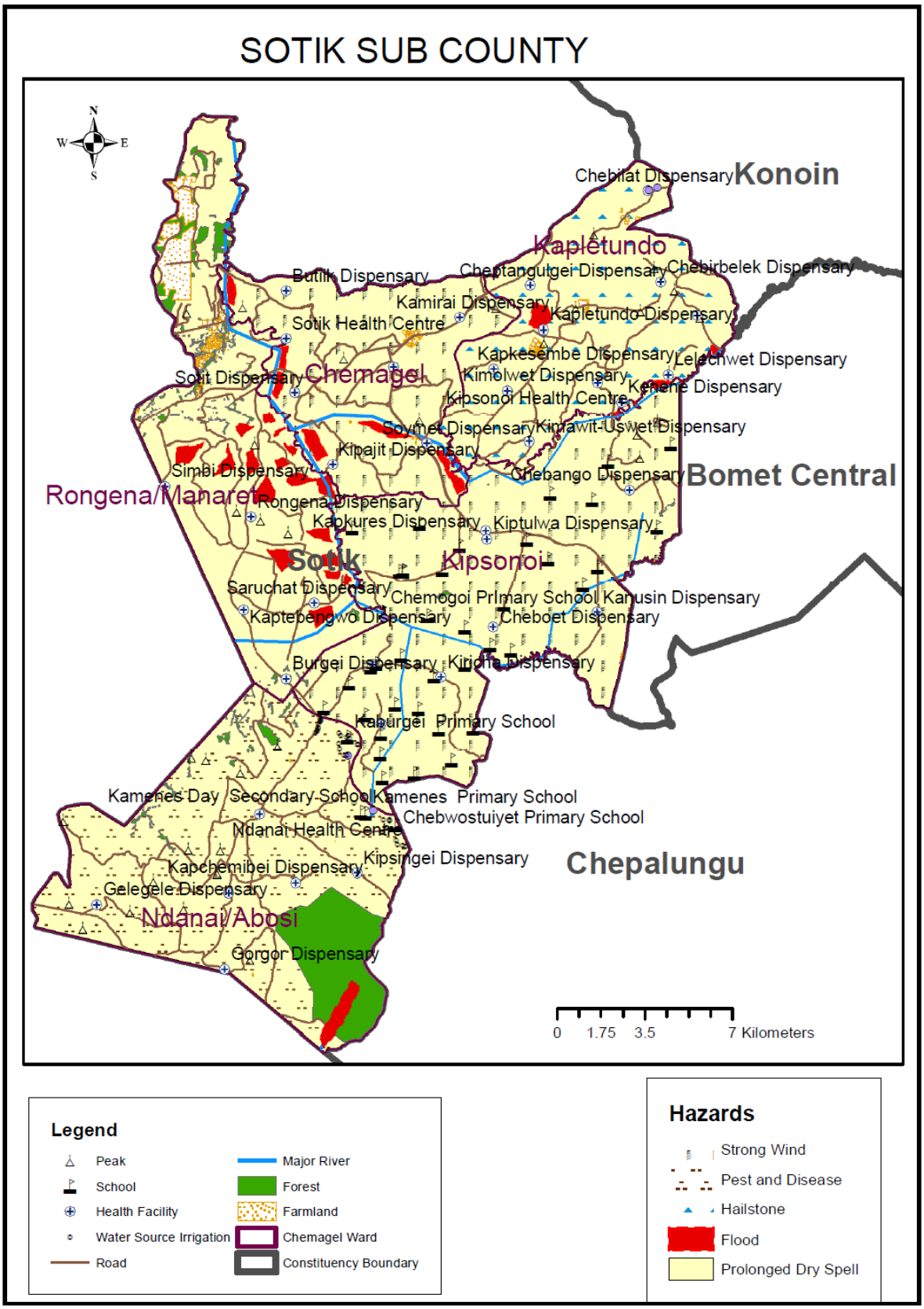


Figure 2-20*:* Hazard map for Sotik Sub county

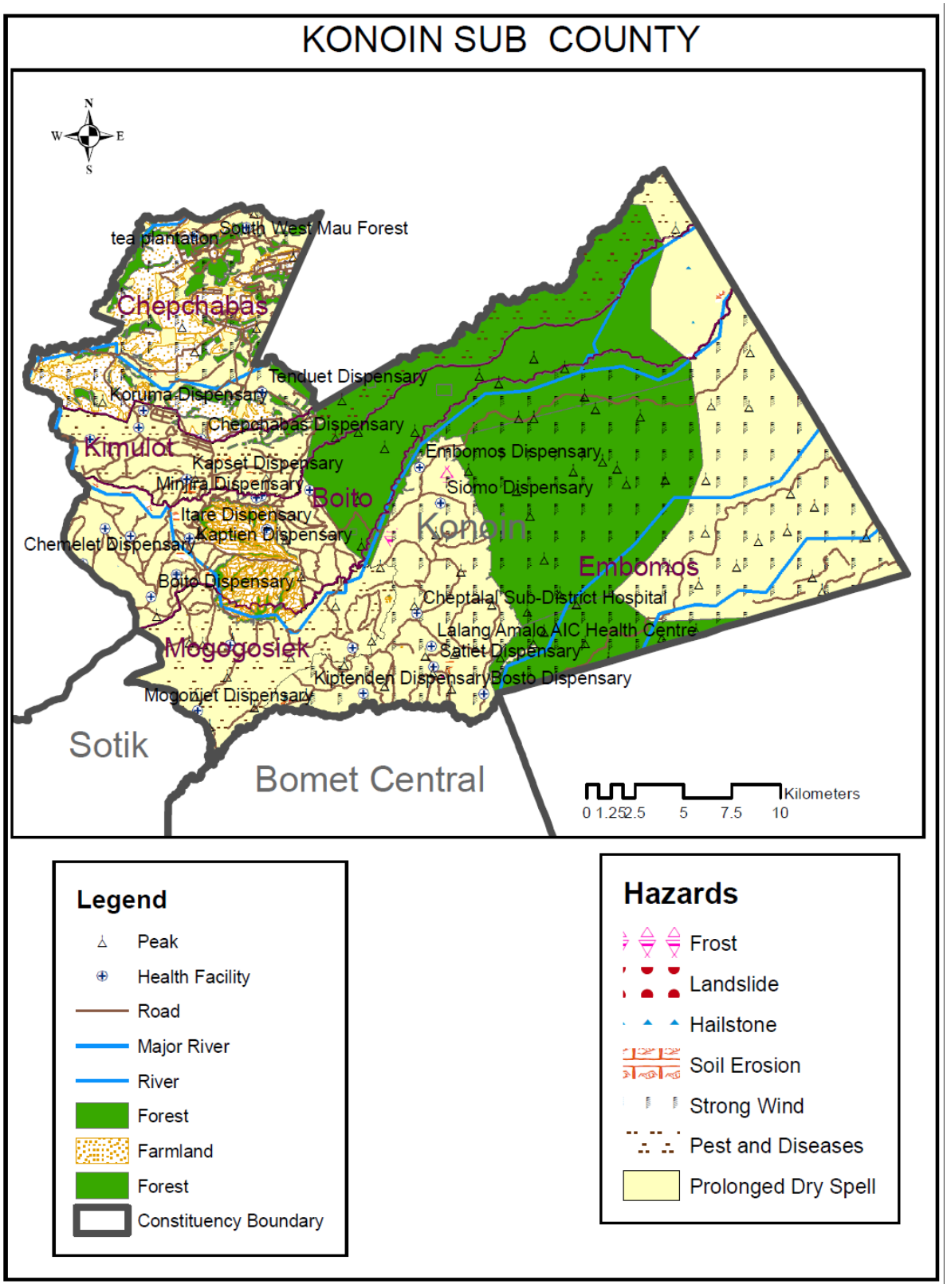


Figure 2-21*:* Hazard map for Konoin sub county

3 Analysis of Existing Resilience/ Adaptation Strategies to Current and Future Climate Risks

3.1 Overview of existing adaptation/resilience strategies and their effectiveness to current climate risks

The table below indicates the community's response to climate change. A group of participants in every ward proposed the local response for every impact and whether it was effective or sustainable.

Table 3-1: Assessment of community's response to climate change

Hazard/ Risk	Impact	Local Response	Effectiveness	Sustainability
Prolonged dry spell	Low crop yields	• Doing Non-farm activities e.g. activities such as fetching and selling firewood • Pruning tea during dry spell • Buying food • Irrigation • Growing drought escaping crops	+++ + + +++ ++	+ + + + +++
	Water shortage	• Long distance in search of water • Purchase of water • Economical use of available water	++ ++ ++	0 0 +
	Food shortage	• Rationing meals	+++	+
	Loss of income	• Manual jobs • Begging	+ +++	0 +
	Fodder/ pasture shortage	• Grazing in the forest • Destocking • Buying pasture/ animal feeds	+++ ++ +++	+ ++ +
	Loss of crops/ crop failure	• Replanting	+	+
Soil Erosion	Low soil fertility	• Application of fertilizers • Crop rotation	+++ +++	+ +++
	Damage of road networks	• Grading and murraming • Building cut-off drains • Culverts	+++ +++ ++	+++ +++ +
	Water pollution	• Water treatment • Looking for alternative clean water	+++ +++	+++ +++
	Destruction of vegetation	• planting cover crops	+++	+++
Hail stones	Low crop production	• Planting of cover crops	++	+
	Loss of income	• Diversification	+++	+++
	Death of livestock	• Construction of shelters/ sheds	+++	+
Pests and diseases	Low production	• Spraying with pesticides • Uprooting the affected crops	++ +	+ +
	Loss of income	• Begging • Diversifications • Casual jobs	+ ++ ++	0 ++ +

Hazard/ Risk	Impact	Local Response	Effectiveness	Sustainability
	Food shortage	• Buying food • Diversification/ crop rotation	+++ ++	+ ++
	High mortality rate (Livestock)	• Selling of animals • Vaccination	+++ +++	+ +

Key

+	low
++	Medium
+++	High
0	None

As shown in the table, the local response to the impacts of the prolonged dry spell include increase in non-farm activities such as fetching and selling firewood to substitute income from tea farming. This response was rated to be highly effective BUT not sustainable. On water shortage, the community members are forced to seek for alternative water sources, hence, travel for long distance for search of water. This again is not sustainable. It was noted that, crop rotation, diversification on income generating activities, and treatment of water were found to be more effective and sustainable in responding to the impacts of pest & diseases and soil erosion, as well as prolonged dry spell.

3.2 Effectiveness of adaptation/resilience strategies to future climate risks

Various strategies were proposed by the community as adaptation strategies to hazards and risk. As shown in the table below, the adaptation strategies for the impacts caused by prolonged dry spell, pest and diseases, floods, strong winds by local community include: exploring the alternative water sources, rain water harvesting, water storage using tanks, construction of dam and water pans, growing drought resistant/escaping crops, proper drainage – culverts, terracing and gabion building, afforestation, practicing modern farming systems, crop rotation and use of pesticides and insecticides (routine spraying).

Table 3-2. Adaptation strategies by the local community

Hazard/ Risk	Impact	Local Response	Stakeholder Group applying the Strategy	Gender and social inclusion information
Prolonged dry spell	Low crop yields	• Doing Non-farm activities e.g. activities such as fetching and selling firewood • Pruning tea during dry spell • Buying food • Irrigation • Growing drought escaping crops	Women Farmers Community/ Households	Women and youth participate in the response. The women, youth, PWDs and other vulnerable groups were involved during focus group discussion.
	Water shortage	• Long distance in search of water • Economical use of available water or reuse • Purchase of water	Women Household heads	
	Food shortage	• Rationing meals	Women,	

Hazard/ Risk	Impact	Local Response	Stakeholder Group applying the Strategy	Gender and social inclusion information
		• Buying food • Borrowing food from relatives and neighbours	Household heads,	
	Loss of income	• Manual jobs • Begging	Farmers Vulnerable groups	
	Fodder/ pasture shortage	• Grazing in the forest • Destocking • Buying pasture/ animal feeds	Pastoralist/ farmers/ communities	
Soil Erosion	Low soil fertility	• Application of fertilizers • Crop rotation • Construction of the soil control structures like terraces, gabions etc.	Farmers Communities	
	Damage of road networks	• Building cut-off drains • Culverts • Grading and murraming	County government	
	Water pollution	• Water treatment • Looking for alternative clean water	Women / household heads/ community	
	Destruction of vegetation	• planting trees and cover crops	Farmers / communities	
Hail stones	Low crop production	• Planting of cover crops	Farmers	
	Loss of income	• Diversification	Household heads/ communities	
	Impact on livestock	• Construction of shelters/ sheds	Farmers, pastoralists	
Pests and diseases	Low of crop production	• Spraying with pesticides • Uprooting the affected crops	Farmers Communities	
	Loss of income	• Begging • Diversifications • Casual jobs	Vulnerable groups Household heads	
	Food shortage	• Buying food • Diversification/ crop rotation	Farmers communities	
	High mortality rate (Livestock)	• Selling of animals • Vaccination	Pastoralist/ farmers	

3.3 Sectoral climate change adaptive strategies

3.3.1 Agriculture

To curb the impacts on climate change in the county, various strategies were given out by the respondents in the region. Most of the local response opted to shift to growing crops that are more tolerant to drought conditions. Examples of such crops include drought-tolerant maize, sorghum, and millet. These crops are more resilient to water stress and require less water to grow, making them better suited to the region's changing climate.

Shift from rainfed crop farming to irrigation farming. This can be done through harvesting and storage of rainwater in small-scale water structures such as water tanks, dams, ponds, and terraces which can be used for irrigation during dry season. Farmers can also diversify their crops to reduce their vulnerability to climate change. This involves growing a variety of crops that are suited to the region's changing climate. Crop diversification can help to ensure that farmers have a range of crops to fall back on if one crop fails due to weather conditions. Farmers can also adopt soil conservation practices such as terracing, cover cropping, and conservation tillage. These practices help to improve soil health, reduce soil erosion, and increase the amount of water that is retained in the soil. Proper drainage to be done to reduce the effects of flooding.

To mitigate the impacts of pests and diseases, farmers in Bomet County can use integrated pest management strategies, such as crop rotation, use of resistant varieties, use of pesticides and insecticides and biological control methods. Additionally, the government and other stakeholders can invest in research and extension services to develop and disseminate effective pest and disease management strategies to farmers.

Livestock farmers can adopt climate-smart livestock farming practices such as improving pasture management, using drought-tolerant livestock breeds, livestock control and integrating livestock with crops. Further, the respondents suggested to plant and store animals' feeds, and increase of veterinary services to curb livestock disease. These practices help to reduce the impact of climate change on livestock farming.

3.3.2 Water resources

To curb the impact of climate change hazards on water sector, the respondents prioritized that increase water storage facilities such as dams, reservoirs (water pans) and ponds will help to ensure a reliable supply of water during the dry season. The county government and other stakeholders can invest in water infrastructure, such as dams and boreholes, to increase water availability and reduce the impact of prolonged dry spells.

Managing watersheds can help to improve the quality and quantity of water resources. This can be done through activities such as reforestation, which helps to reduce soil erosion and increase infiltration of water into the soil. Additionally, farmers can adopt conservation agriculture practices, which improve soil health and reduce soil erosion. Protection of riparian land to be done in order reduce water pollution. Proper drainage can be done to reduce the impacts of floods to water sources. In addition, the County can maximize on harvesting storm water to reduce chances of flooding and its impacts.

Education and awareness campaigns can help to inform residence about the impacts of climate change on water resources and the need to adopt sustainable water management practices. These campaigns can be conducted through workshops, training sessions, and community meetings and barazas.

3.3.3 Human Health

To curb the effects brought by climate changes hazards in the County, some of the response from the locals include; improving food security, increasing access to clean water, provision of treated mosquito nets and Strengthening health systems.

To curb the problem on foodborne diseases such as malnutrition and related illnesses, agriculture sector which have been greatly affected by climate change can invested on to

increase food security in the county. Bomet County can promote food security by investing in climate-resilient agriculture, improving access to markets, and supporting small-scale farmers.

Strengthening disease surveillance: Climate change can lead to the spread of diseases such as malaria, dengue fever, and cholera. Bomet County can strengthen its disease surveillance system to monitor the incidence of these diseases and respond quickly to outbreaks. In addition, proper drainage can be done to control the chances of stagnant and pooling of water. The county government can also provide its residents with treated mosquito nets to minimize chances of malaria disease.

Increasing access to clean water: Bomet County can invest in water treatment facilities and boreholes to ensure that residents have access to clean and safe water for drinking and sanitation.

Strengthening health systems: Extreme weather events can strain healthcare systems, particularly in rural areas. Bomet County can strengthen its healthcare system by investing in healthcare infrastructure, increasing the number of healthcare workers, and providing training to healthcare workers on climate-related health issues.

3.3.4 Infrastructure

Infrastructure design: Infrastructure can be designed to withstand the impacts of climate change, such as increased rainfall and extreme temperatures. This can be done by incorporating climate change projections into infrastructure design and construction.

Maintenance and repairs: Regular maintenance and repairs of infrastructure can help to ensure that it remains functional and resilient to climate change. This can involve the repair of damaged infrastructure or the retrofitting of existing infrastructure to make it more resilient to climate change.

Infrastructure relocation: In some cases, infrastructure may need to be relocated to avoid the impacts of climate change, such as floods or landslides. This can involve the relocation of roads, bridges, and other infrastructure to safer locations.

Early warning systems: Early warning systems can help to alert residents and infrastructure managers of impending weather events, such as storms or floods. This can give them time to prepare and take appropriate actions to protect infrastructure.

Public awareness: Public awareness campaigns can help to educate residents and infrastructure managers about the impacts of climate change on infrastructure and the need for adaptation measures. This can be done through community outreach programs, public education campaigns, and the dissemination of information through various media channels.

3.3.5 Forestry

The respondents prioritize on reforestation and afforestation, forest conservation, forest restoration and management in order to reduce the impacts of climate change on forest and increase forest cover in the region.

The study recommends the following strategies;

Reforestation and afforestation: Planting new trees and restoring degraded forests can help increase forest cover and enhance the resilience of forests to climate change impacts, such as drought and wildfires.

Agroforestry: Introducing agroforestry practices, such as intercropping trees with agricultural crops, can help improve soil health, increase biodiversity, and provide additional sources of income for local communities.

Forest conservation: Protecting existing forests through conservation measures, such as community-based forest management, can help maintain biodiversity, carbon sequestration, and other ecosystem services provided by forests.

Forest restoration and management: Restoring degraded forests and implementing sustainable forest management practices, such as selective harvesting, can help improve the health and productivity of forests and reduce the risk of wildfires and other disturbances.

Diversification of tree species: Planting a diverse range of tree species, including both indigenous and exotic species, can help increase the resilience of forests to climate change impacts and enhance the ability of forests to provide a range of ecosystem services.

Education and awareness-raising: Educating and raising awareness among local communities, stakeholders, and policymakers about the impacts of climate change on forestry and the importance of sustainable forest management practices can help build support for adaptation and mitigation measures.

4 Bomet County Climate Strategic Adaptation Investment/Action Priorities

4.1 Identification of strategic climate action priorities

This assessment has identified strategic areas where climate change action will be linked to the CIDP key activities (e.g. Water provision, food security, environmental conservation, development of agricultural value chain). It was established that negative impacts affecting the community include; an increase in vector-borne diseases, such as malaria and cholera; damage to infrastructure in homes, schools, hospitals, and public places; and food insecurity due to prolonged dry spell, increased cases of hailstones affecting tea production.

4.2 Priority County Climate Change Actions

For each of the seven priority areas for adaptation, two priority areas for mitigation and five cross-cutting strategies, specific actions are identified that will be required to implement each of the sub-objectives in the short, medium and long term. Lead and supporting government agencies and other stakeholders responsible for implementation of each of the activities are identified.

4.2.1 Adaptation

Adaptation refers to adjustments in natural or human systems to respond to the potential impacts of climate change, thereby reducing the risk of harm and exploiting beneficial opportunities. In its climate change response, Bomet county will prioritise the adoption of adaptation strategies as a means of urgently addressing its high vulnerability and low ecological, social and economic resilience to climate change. Several adaptation interventions also support priorities for development identified in its CIDP.

Adaptation Objective: To reduce Bomet county's vulnerability to climate change through enhancing its adaptive capacity and resilience to the impacts of climate change.

To achieve the adaptation objective and in support of its sustainable development goals, actions in the following priority areas shall be implemented:

4.2.2 Food security and nutrition

Food security and nutrition			
Objective: To integrate environmental management and risk reduction and management strategies into agricultural development.			
Sub-objectives	**Activity**	**Timeframe**	**Lead agency** (and key collaborators)
1. Integrate climate change and risk reduction and management criteria into legislation, regulations, policies, plans and programmes in the agricultural and fisheries sectors.	a) Undertake an assessment of the laws and policies governing the agricultural and fisheries sectors, including the relevant institutions and their authority.	Short-term	**Departments of Agriculture** + Disaster Management + Department of Climate Change + farmers associations.
	b) Identify areas of the regulatory framework where decision-making relevant in climate change preparedness could be strengthened, including gaps or	Short-term	

	conflicts which undermine objectives, and develop and execute proposals for undertaking amendments or revisions to the regulatory system to address these challenges.		
	c) Capitalise on existing regional corporation efforts e.g. Lake Basin, Lake Region Economic Bloc to integrate climate change considerations into agriculture through incorporation of agreed commitments into legislation, relevant sectoral strategies, and work plans.	Short-term	
	d) Integrate and harmonise climate change adaptation and risk reduction and management in designing policies, plans and programs.	Medium-term	
2. Facilitate and promote climate-smart practices in the agricultural sector, including through investments in improved practices, technology and infrastructure that result in enhanced efficiency and capacity, increased resilience to climate change and natural disasters.	a) Develop an accessible database and system for dissemination of information on forecasted weather patterns for farmers.	Medium-term	**KMD**
	b) Develop and test adaptive measures in drought-prone areas through combining appropriate crops, new cropping patterns and land and water management practices.	Medium-term	**Department of Agriculture** + farmers associations + KMD
	c) Promote and employ climate-smart agricultural practices, including soil and water conservation best practices such as the use of hard and soft erosion control methods; increased water storage capacity for harvesting water in the wet season; non-chemical based integrated pest management systems; shade trees in pastures and live fences to provide fodder and lessen the impacts of hot weather; alternative farming methods that are suitable for emerging climatic conditions (e.g. dry farming, drip irrigation); and sheltered production systems (shade and greenhouses).	Short-Medium-term	
	d) Develop and implement integrated pest management systems.	Short-Medium-term	
	e) Develop a monitoring and response systems for pests, disease and invasive species.	Medium-term	
	f) Promote the practice of backyard gardening to reduce dependence on food support.	Short-term	
	g) Strengthen veterinary services systems, including animal health measures to prepare for the possible impacts of climate change.	Short-Medium-term	

	h) Identify areas where agro-forestry could best be practiced and develop and execute training and educational programs for farmers and relevant departmental officers to support the practice. Ensure that climate change considerations are reflected in the Physical Development Plan and support activities regarding appropriate land use.	Short-Medium-term	
3. Explore synergies with other sectors to develop innovative agricultural programmes that support economic diversification and promote enhanced natural resource management, including via agro-forestry, agro-tourism and food festivals.	a) Ensure that climate change considerations are reflected in the *relevant policies*.	Short-Medium-term	**County attorney +** department of climate change
	b) Develop a resource network to provide technical assistance, through capacity building and dissemination of accessible knowledge products to improve preparedness for climate change impacts.	Short-term	**Department of Climate Change** + Small Business Association + farmers associations
	c) Improve and expand the agriculture and fisheries extension service especially to highly vulnerable individuals and communities.	Short-Medium-term	**Department of Agriculture** + Ministry of Health
4. Enhance extension activities and support services to small scale farmers and enable them to better prepare for and respond to climate impacts to protect and sustain their livelihoods.	a) Develop strategies to encourage youth involvement in agriculture and fisheries including via the promotion of agriculture as a career and awareness creation	Short-Medium-term	**Department of Agriculture** + Economic Development and Trade + farmers associations
	b) Improve public risk financing structures to enhance the development of agricultural insurance, including crop and livestock insurance mechanisms, and educate farmers as to the benefits of participating in these programs.	Medium-term	
	c) Strengthen farmer associations and their capacity to address climate change risks.	Short-term	

4.2.3 Natural ecosystems and resources

Natural ecosystems and resources			
Objective: To ensure the health and productivity of natural ecosystems to improve their resilience to climate change and their ability to provide ecosystem services that act as adaptation measures.			
Sub-objectives	**Activity**	**Timeframe**	**Lead agency** (and key collaborators)
1. Strengthen natural resource management legislation, regulations, policies, plans and programmes through integration of climate change and risk reduction and management considerations into ecosystem-based management approaches.	a) Ensure that regulations and other relevant legislation reflect climate change considerations.	Short-term	**Department of** Climate Change + County Attorney + County assembly
2. Conduct assessments of ecosystem and species vulnerability to climate change and integrate in biodiversity conservation planning.	a) Undertake vulnerability assessments for key terrestrial ecosystems (forests, watersheds, wetlands) and develop management plans	Medium-term	**Department of** Climate Change + NEMA

	to address risks from climate change.		
	b) Integrate climate change considerations into protected area management plans.	Medium-term	
	c) Ensure that species action plans for vulnerable species that are at risk from climate change address climate change considerations. I	Medium-term	
3. Manage ecosystems and species to reduce other threats that weaken their resilience, including through reducing the spread of invasive species, deforestation and forest degradation, and unsustainable uses of forest resources.	a) Develop invasive species management strategies and incorporate risks due to climate change.	Short-term	**Department of** Climate Change + NEMA
4. Protect and enhance forest ecosystems to capitalise on ecosystem services, such as watershed protection and soil stabilisation services to build resilience to impacts of heavy rainfall, drought and high winds.	a) Monitor and evaluate the impacts of climate change on hydro-geological conditions.	Medium-term	**Department of** Climate Change + NDMA NEMA KFS WRA
	b) Conduct forest restoration and protection and use soil and water conservation methods to limit flash flooding and soil erosion in vulnerable areas.	Short-Medium-term	
5. Protect forests from human activities e.g. charcoal burning	a) Provide energy saving Jikos to women	Short term	Department of Climate Change + NEMA, KFS
	b) Sensitize communities on reforestation	Short-Medium-term	

4.2.4 Water security and management

Water security and management			
Objective: To provide a safe and reliable supply of water to Bomet county's population and ensure efficient use of this resource			
Sub-objectives	**Activity**	**Timeframe**	**Lead agency** (and key collaborators)
1. Create an enabling legal, institutional and regulatory environment to govern the sustainable use of water resources and address possible inefficiencies, conflicts and gaps.	a) Identify areas of the regulatory framework where decision-making relevant in climate change preparedness in the water sector should be strengthened, including gaps or conflicts which undermine objectives, and develop and execute proposals for undertaking amendments or revisions to the regulatory system to address these challenges.	Short-term	**Department of water** + BOWASCO Ltd. + County Attorney + County assembly + Climate Change
	b) Clarify the role and authority of Bomet water and sanitation company in the implementation of policies specific to the sector or regarding climate change.	Short-term	
2. Mainstream climate change and disaster risk reduction and	a) Develop a water strategy which incorporates an Integrated Water Resources Management[1] approach	Short-term	**Department of water** + BOWASCO. +

[1] Integrated Water Resources Management (IWRM) is defined as "a process which promotes the coordinated development and management of water, land and related resources in order to maximise economic and social

management considerations into policies, plans and programmes for water management.	and addresses climate change and disaster risk reduction and management concerns. Strategies should include increased rain water harvesting and storage, water conservation and water recycling and reuse.		County Attorney + Lake Victoria south water works
	b) Review and strengthen as appropriate legislative measures to conserve and monitor water in large commercial users.	Short-term	
	c) Ensure revisions to the *Building Code* stipulate the minimum tank size for rain water harvesting and safe storage as determined by the size of house and or family and provide fiscal incentives to encourage implementation.	Short-Medium-term	**Physical Planning department +** Economic Development and Trade
3. Reduce the vulnerability of the water supply system through climate-proofing water storage, supply, and distribution infrastructure.	a) Undertake an inventory of underground and surface water resources, and an assessment of water use and demand by sector in order to determine the water balance.	Short-term	**Department of water +** BOWASCO.
	b) Promote the use of renewable energy sources to produce water thereby reducing vulnerability to electricity outages and reducing the cost of water.	Short-Medium-term	
4. Protect water sources from pollution including through suitable watershed and wastewater management strategies.	a) Develop *Conservation and Environmental Management Bill* to address water contamination issues to enhance the resilience of water resources.	Short-Medium-Long-term	**Department of Environment +** Department of water + BOWASCO+ NEMA.
5. Design and implement programmes for increased community and private sector participation in water resource management and conservation, including through enhancing efficiency of use, use of storage tanks, rainwater harvesting for agriculture and recycling of grey water.	a) Promote the installation of water conservation devices in large water users.	Short-Medium-term	**BOWASCO. +** Department of Climate Change
	b) Encourage the use of grey water for gardening and irrigation, etc.	Short-term	
	c) Develop a system for harvesting rain water for irrigation of agriculture.	Medium-term	

4.2.5 Human health and well-being

Human health and well-being			
Objective: To reduce the negative impacts of climate change on human health and well-being.			
Sub-objectives	**Activity**	**Timeframe**	**Lead agency** (and key collaborators)
1. Assess the vulnerability of the health sector to	a) Undertake assessment of climate risks to health service delivery and produce a strategic sector plan that	Medium-term	**Ministry of Health +** NDMA + Department of Climate Change

welfare in an equitable manner without compromising the sustainability of vital ecosystems." (Global Water Partnership 2010)

climate change impacts.	builds resilience to climate change impacts.		
	b) Evaluate climate vulnerability of existing and proposed waste management systems and climate proof vulnerable systems.	Medium-term	
2. Mainstream climate change and disaster risk reduction and management considerations into health sector policy, plans and programmes, with emphasis on vulnerable groups.	a) Ensure health service delivery can address anticipated impacts from climate change.	Short-term	**Ministry of Health**
	b) Incorporate local knowledge into the development of health policies.	Short-Medium-Term	
	c) Address climate change impacts on human health in health financing, medical and disability policies and insurance.	Medium-term	**Ministry of Health** + Economic Development and Trade
	d) Develop vector control programme.	Short-term	**Environmental Health**
3. Integrate nutrition and food security into health sector planning.	a) Address climate change impacts on food security and nutrition in updates to the nutrition policy and plan.	Medium-term	**Ministry of Health**
4. Facilitate the development of integrated waste management systems to improve sanitation, sewage and solid waste and disposal in towns.	a) Undertake evaluation of liquid and solid waste management in towns and risks from climate change.	Short-term	**Environmental Health + NDMA**
	b) Develop integrated waste and sewage management plans to address risks from climate change.	Medium-term	
5. Improve systems to efficiently monitor environmental health indicators, such as air and water quality.	a) Undertake comprehensive water quality monitoring.	Short-Medium-Long-term	**Environmental Health**
	b) Develop *Conservation and Environmental Management Act* to reduce levels of pollution that affect human health and wellbeing.	Short-Medium-Long-term	**Department of Environment + Health**
6. Strengthen information and knowledge of linkages between disease and climate change.	a) Improve coordination and information sharing on temperature forecast data to enhance preparedness and response to health-related illnesses.	Short-term	**Kenya Meteorological department**

4.2.6 Sustainable physical development

Sustainable physical development			
Objective: To climate-proof existing and planned physical infrastructure in Bomet county			
Sub-objectives	**Activity**	**Timeframe**	**Lead agency** (and key collaborators)
1. Intensify efforts to strengthen the enabling legal, institutional and regulatory environment governing physical development and land-use zoning to address inefficiencies, conflicts and gaps with regard to	a) Identify areas of the regulatory framework where decision-making relevant in climate change preparedness in the physical development sector should be strengthened, including gaps or conflicts which undermine objectives, and develop and execute proposals for undertaking amendments or revisions to the regulatory system to address these challenges.	Short-term	**Physical Planning department +** Ministry of Agriculture + Ministry of Health + Ministry of public works + Disaster Management Department.
	b) Ensure that physical development plans address climate change impacts,	Medium-term	

climate change responses. 2. Harmonize physical development planning with other strategies for enhanced water and energy efficiency, security and management and land use to support agriculture and other uses.	including through using proper setbacks for urban development and Environmental Impact Assessments (EIAs).		
3. Integrate climate change and disaster risk reduction and management considerations into physical development policies, plans, programmes and projects.	a) Ensure that climate change risks are considered during the project EIA process and are integrated into any environmental management plan.	Short-Medium-term	**Physical Planning department + NEMA** + associations of architects and engineers + Disaster Management department
4. Assess the vulnerability of critical infrastructure and develop and implement plans to climate-proof critical infrastructure.	a) Draw on existing work by the Disaster Management unit and integrate climate change considerations into vulnerability mapping and development of community-based climate change and disaster response plans.	Short-term	**Physical Planning department +** associations of architects and engineers + Disaster Management department +
	b) Support the use of climate-resilient designs model buildings.	Short-Medium-term	
	c) Establish and climate proof road and utilities network in the county	Medium-term	
	d) Construct silt traps in streams to conserve soil.	Short-Medium-term	
5. Expand or improve transportation networks, particularly to vulnerable communities.	a) Increase and/or improve access roads to vulnerable communities.	Medium-term	**Department of roads** + Disaster Management Unit +

5 Conclusion

The impacts of climate change are already becoming a severe burden to the county's economy and its people. The county is actively addressing some of these risks for example, through the construction of alternative water sources, forest conservation efforts and construction of roads. This PCRA will help the county prepare climate change action plan for short, medium, and long-term interventions. The increasing climate change will pose challenges for the county's development aspirations especially the change in rainfall patterns, and increased frequency of prolonged dry spell, soil erosion, hailstones and flooding.

Current climate change is extremely rapid, which places additional stress both on the capacity of ecosystems to adapt and on the lifespan of infrastructure. Bomet County needs to urgently invest in building resilient systems to address the impact of climate change. All stakeholders, including the government and private sectors as well as community buy-in should be involved.

APPENDIX

Appendix I: Vulnerability assessment for each ward

Sub-county	Ward	Vulnerability	Impacts	Adaptation strategies
Bomet East	Chemaner	Prolonged Dry spell Pest & Diseases Floods Landslides Soil erosion	Scarcity of water, livestock and crop diseases, crop failure, crop damage, reduced production food insecurity, high production cost, loss of fertile soil, water pollution, infrastructure damage and increase in poverty level	Borehole drilling, harvesting and storage of water by tank, dam and water pan construction, drought resistant crops, proper drainage – culverts, terracing and gabion building, afforestation, following, preserve of riparian areas, planting on time, crop rotation and routine spraying
	Kipreres	Prolonged Dry spell, floods, pest and diseases, strong winds, lightning and thunderstorm	Crop failure/Food shortage, scarcity of water, scarcity of animal pasture, livestock diseases, loss of livestock, crop damage and loss of fertile soil.	Human and livestock food storage, controlling livestock number, planting drought-resistant crops Construction of water pans and dams, increasing veterinary services, roper timing of planting season, proper drainage, rainwater harvesting, installation of lightning arrestors
	Longisa	Prolonged Dry spell Crop Pest & Diseases Floods Soil erosion	Crop failure/ Food shortage, water shortage, reduced livestock pasture, reduced and Low-quality yields, increase production, damage of water infrastructure (water pan), crop damage and water pollution	Food storage, planting drought-resistant crops, crop diversification, proper timing of planting, storage of water, harvesting and storing rainwater, water treatment, increasing veterinary services, reducing livestock number, proper drainage, opening of spillways, gabion building and terracing
	Meregi	Prolonged Dry spell Crop pest & Diseases Soil erosion Floods Landslide	Scarcity of water, food shortage, low yield/ poor quality yield, crop damage and failure, increase production cost, damage to infrastructure	Water harvesting and storage, spring protection, planting short season crops, food storage, proper timing of planting in time, crop rotation, fallowing, terracing, preservation of riparian areas
	Kembu	Floods Prolonged Dry spell	Crop failure and damage, food shortage, water	Borehole drilling, planting of drought-resistant crops, diversification, use of

Sub-county	Ward	Vulnerability	Impacts	Adaptation strategies
		Soil erosion Crop pests & Diseases Frost and hailstones	scarcity, low- and poor-quality yields, food insecurity, increase production cost	greenhouses and irrigation, building of gabions, planting of cover crops
Sotik	Chemagel	Prolonged Dry spell Floods Strong winds	Crop failure and damage, human and livestock food shortage, water scarcity, livestock pest and diseases, damage of water infrastructure and roads, soil erosion and displacement of people	Planting drought resistant crops, storage of water Moving to higher grounds, proper drainage, planting cover crops, planting of trees to act as wind breakers, gabion building and terracing
	Kipsonoi	Prolonged Dry spell Floods Strong winds	Crop failure and damage, food shortage, water shortage, pest and diseases outbreak, outbreak of waterborne diseases, damage to infrastructure, crop damage, loss of livestock and human life, destruction of buildings	Planting draught resistant crops, water rationing, increase in water storage, se of pesticides, proper drainage, water treatment, creating awareness, planting trees to act as wind breakers
	Rongena/ Manaret	Prolonged Dry spell Floods Strong winds Hailstones lightning	Crop failure and damage, food shortage, water shortage, pest and diseases outbreak, water pollution, soil erosion, House destruction and displacement of people	Food storage, increasing water harvesting and storage (tank and dam construction), planting drought resistant crops, drilling of boreholes, practicing irrigational farming, use of pesticides and crop rotation, proper drainage, water treatment, temporary shelter, planting of trees to act as wind breakers
	Kapletundo	Prolonged Dry spell Floods Soil erosion Hailstones	Crop failure and damage, food shortage, water shortage, pest and diseases, soil erosion, displacement of people, human diseases	Water storage (water harvesting during rainy season), proper drainage, planting cover crop; use of mosquito nets, water treatment, temporary relocation

Sub-county	Ward	Vulnerability	Impacts	Adaptation strategies
	Ndanai/ Abosi	Prolonged Dry spell Crop Pest & Diseases Floods	Crop failure/ low yields, water shortage, reduced livestock pasture, reduced and Low-quality yields, food insecurity, increase production cost, water pollution, soil erosion, displacement of people	Planting drought resistant crops, practicing irrigational farming, controlling livestock number, increasing water harvesting and storage, crop diversification, proper timing of planting, use of pesticides, proper drainage, temporary shelter during flooding, water treatment
Chepalungu	Chebunyo	Prolonged Dry spell Crop pest and diseases Floods	Water shortage, Crop failure and damage, food shortage, low crop yields, pest and disease outbreak, low pasture, livestock loss, Increase in cost of production, low income, water pollution, soil erosion, loss of animal and human life	Increasing water harvesting and storage (tank and dam construction), planting drought resistant crops, practicing irrigation, planting certified seeds, proper drainage, terracing and gabion building, resettlement
	Kong'asis	Prolonged Dry spell Floods Weather Variability Crop pest and diseases	Water shortage, Crop failure and damage, food shortage, low pasture, loss of livestock, damage to infrastructure such water pans, soil erosion	Increasing water harvesting and storage (tank and dam construction), planting drought resistant crops, pasture conservation, practicing irrigational farming, proper drainage, terracing and gabion building
	Sigor	Prolonged Dry spell Crop pest and diseases Soil erosion	Water scarcity, crop failure and pasture reduction Outbreak of livestock and human diseases, loss of livestock, low crop yields, food shortage, increase in poverty	Increasing water harvesting and storage (tank and dam construction), planting drought resistant crops, drilling of boreholes, practicing irrigational farming, crop rotation, use of organic manure, planting certified seeds, conservation of riparian areas, terracing and gabion building, control grazing, planting cover crops
	Nyangores	Prolonged Dry spell Crop pest and diseases	Water scarcity, crop failure and damage, food shortage, outbreak of crop	Increasing water harvesting and storage (tank and water pan construction), planting drought resistant

Sub-county	Ward	Vulnerability	Impacts	Adaptation strategies
		Floods	diseases, low, agricultural production, livestock pasture lost, increase in cost of production, soil erosion, Loss of soil fertility, damage to infrastructure	crops, small scale irrigational farming, planting diseases resistant crops, practicing crop rotation
	Siongiroi	Prolong dry spell, Crop pest and diseases Soil erosion	Water shortage, crop failure, low agricultural yields, loss of livestock, food shortage, increase in poverty level, loss of soil fertility, destruction of pasture, water pollution, gulley development	Harvesting and storage of rainwater, planting drought resistant crops, practicing irrigation, disease resistant varieties, crop rotation, planting certified seeds use of organic manure, planting cover crops, terracing and gabion building, control grazing, conservation of riparian lands
Konoin	Embomos	Prolonged dry spell Hails stones Soil Erosion	Water scarcity, crop failure and damage, reduced crop yield quality and quantity, food insecurity, increase in poverty level, reduced of soil fertility, river/stream pollution (siltation and sedimentation), destruction of Roads, wild fires,	To strengthen the capacity of the farming community to spearhead on farm soil conservation, increase capacity to cope with drought, Improve the capacity of farmers to cope with hailstones
	Boito	Prolonged dry spell Hails stones Soil Erosion	Water shortage, food shortage, low crop production, low milk production, low yield, loss of income, loss of soil, damage to crops, water pollution, damage to water sources, destruction of buildings, destruction of Forest cover	Engage community to device methods to limit effects of prolonged dry spell, strengthen the capacity of the community to soil conservation, Combat effects of hailstones
	Mogogosiek	Prolonged dry spell Pest and diseases Hails stones	Water shortage, low agricultural production, destruction of	Water harvesting and storage, piping of clean water, planting of drought resistant crops, irrigation,

Sub-county	Ward	Vulnerability	Impacts	Adaptation strategies
			vegetation, pest and diseases, food shortage, water pollution, livestock loss, low income and increase in poverty level, damage of road network	rotational farming, use of pesticides and insecticides, controlling livestock number, planting of cover crops, terracing and gabion, avoid agricultural activities in steep sloppy areas instead to plant trees, proper drainage on the roads
	Kimulot	Prolonged dry spell Hails stones Pest and diseases	Water shortage, food shortage, low crop & livestock yields, excess dust roads, high temperatures, pests & Diseases, low crop production, loss of livestock, low income	Water harvesting and storage, piping of clean water, planting of drought resistant crops, irrigation, rotational farming, use of pesticides and insecticides, controlling livestock number, planting of cover crops, terracing and gabion, avoid agricultural activities in steep sloppy areas instead to plant trees, proper drainage on the roads
	Chepchabas	Prolonged dry spell Soil erosion Hails storms Strong winds	Water shortage, low tea yields, Loss of tea bushes, food shortage, fodder/ pasture shortage, loss of livestock, loss soil fertility, low crop production, destruction of vegetation, water pollution, damage of road networks, low income	Water harvesting and storage, protection of wetlands small-scale irrigation, use pf greenhouse, crop livestock control, diversification, planting cover crop, terracing and Gabion building, cut-off drains, culverts,
Bomet Central	Mutarakwa	Prolonged dry spell Crop pest and diseases (maize) Floods Deforestation	Water scarcity, crop failure and damage, food shortage, loss of animal pasture, outbreak of livestock and human diseases, pest invasion, soil erosion, encroachment of riparian areas, drying of wetlands	Water harvesting and storage, borehole drilling, small scale irrigation, fallowing, crop diversification, mulching, disease resistant varieties, proper drainage, early warning, afforestation, public sensitization and engagement, enforcement of regulation

Sub-county	Ward	Vulnerability	Impacts	Adaptation strategies
	Silibwet	Prolonged dry spell Soil erosion	Water shortage, crop failure, food insecurity livestock loss, increase chances of diseases, loss of tree and forest cover, desertification, loss of biodiversity, destruction of water catchments	Harvesting and storage of water, borehole drilling irrigation, drought resistant crops, reforestation, proper waste management, protection of riparian areas
	Singorwet	Pollution Floods	Increase chances of diseases, destruction of ecosystem, loos of property and life, soil erosion, water pollution	Check dams, gabion building, harvesting of runoff water, afforestation, proper waste management, sensitization and public engagement.
	Chesoen	Prolonged dry spell Soil erosion Livestock and crop diseases Invasive species	Water scarcity, crop failure and damage, loss of livestock, reduced agricultural production, food insecurity, water pollution, outbreak of diseases, loss of soil fertility, land degradation, damage to road infrastructure	Harvesting and storage of rainwater, modern farming technology (irrigation and use green house), fallowing, research and disease control mechanisms, waste management, sewage treatment, terracing and gabion building, removal of invasive species in all fragile ecosystems
	Ndarawetta	Prolonged dry spell Crop pest and diseases (maize) Soil erosion Invasive species	Water scarcity, crop failure, low yields, food shortage, loss of soil fertility, land degradation, increase chances of human disease	Harvesting and storage of rainwater, modern farming technology (irrigation and use green house), fallowing, research and disease control mechanisms, waste management, sewage treatment, terracing and gabion building, removal of invasive species in all fragile ecosystems

Appendix II: Workshop report

SUMMARY REPORT: PARTICIPATORY CLIMATE RISK ASSESSMENT TRAINING

The Participatory Climate Risk Assessment technical working group (TWG) and stakeholders' analysis training comprised of **17 sessions**, each focusing on key aspects of climate risk assessment, stakeholder engagement, hazard mapping, and adaptation strategies.

Throughout the training, participants engaged in interactive sessions and practical exercises, fostering a deeper understanding of climate change impacts and the importance of proactive measures. The sessions covered the following topics:

	Session	Key Aspects
1	Introduction to Climate-Risk Assessment	Participants were introduced to the fundamentals of climate risk assessment, emphasizing the need for a participatory approach.
2	Overview of Participatory Climate Risk Assessment (PCRA) Framework:	The PCRA framework was presented, highlighting its relevance in identifying and addressing climate risks.
3	Stakeholder Analysis and Engagement Process	Participants learned about stakeholder analysis techniques and effective strategies for engaging stakeholders throughout the PCRA process.
4	Understanding Stakeholder Expectations	This session focused on ensuring that participants understood how and what to expect from stakeholders during participatory engagements.
5	Community Engagement on PCRA	The importance of community involvement and engagement in the PCRA process was discussed, emphasizing the need for inclusivity.
6	Overview of Hazard Mapping	Participants were introduced to hazard mapping techniques and the significance of accurately identifying and mapping hazards.
7	Data Sources and Methods for Hazard Mapping	This session provided an overview of various data sources and methodologies used in hazard mapping, including historical records, geological surveys, and remote sensing.
8	Practical Exercise	Developing Hazard Maps: Participants engaged in hands-on exercises, developing hazard maps for Bomet County based on identified hazards and their potential impact.
9	Introduction to Adaptation Strategies	The concept of adaptation was introduced, highlighting the importance of developing strategies to address climate risks.
10	Obstacles and Opportunities in Adaptation	Participants discussed the challenges and opportunities associated with implementing adaptation strategies, such as funding constraints and policy support.

11	Identifying Climate Risks	This session focused on identifying climate risks specific to Bomet County, considering both present and future scenarios
12	Assessing Vulnerability	Participants learned about vulnerability assessment techniques to evaluate the susceptibility of populations and ecosystems to climate risks.
13	Prioritizing Adaptation Options	The process of prioritizing adaptation options based on effectiveness, feasibility, and sustainability was discussed, enabling participants to make informed decisions
14	Developing Adaptation Strategies	Participants engaged in a practical exercise, developing adaptation strategies tailored to address the identified climate risks in Bomet County.
15	Monitoring and Evaluation of Adaptation Strategies	This session emphasized the importance of monitoring and evaluating the effectiveness of adaptation strategies to ensure continuous improvement.
16	Capacity Building and Training	The need for capacity building and training programs to enhance resilience-building efforts was discussed, focusing on empowering stakeholders with the necessary knowledge and skills
17	Action Planning and Resource Mobilization	Participants developed an action plan for implementing the PCRA process, encompassing stakeholder engagement, capacity building, monitoring and evaluation, and resource mobilization